THE SEMANTICS OF AIR PASSENGER TRANSPORTATION

Edward MacNeal

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CONTENTS

Acknowledgments v

INTRODUCTION

1. What This Book Is About 3

PART ONE

THE SEMANTICS OF AIR PASSENGER TRANSPORTATION

2. How Many Passengers Are You? 9
3. Diurnal Is Not A Dirty Word 15
4. Leather Helmets Are Old Hat 17
5. Is Your Time Worth Anything? 20
6. The Magical Instantaneous Transporter 23
7. The Invisible Transportation Substitute 27
8. Can You Get There And Back? 30
9. How Big Is The Market? 34

PART TWO

THE SEMANTICS OF AIRPORT LOCATION

10. Do Airports Move? 41
11. Do You Have To Go? 43
12. How Many Miles Equal A Stop? 47

APPENDICES
PROOFS AND OTHER DETAILS

A. Author's Air Travel in 1980 52
B. Denver "Passengers" 54
C. Passengers Confused with Persons 55
D. QSI 56
E. Comments on QSI 57
F. Reasons for Traveling 59
G. Substantive Changes in Trips 62
H. Value of Passenger Time 68
I. Testimony on Nights Away 69
J. Service Stimulation of Trips 73
K. Effect of Service on Trip Duration 85
L. Trips and Duration 88
M. MacNeal Air Service Scale 89
N. Use of Scale 93
O. Alternate Airports 96
P. Accessibility Stimulation 97
Q. Airport Effect by Air Distance 102
R. Service Effect in Interrelated Markets 107

BIBLIOGRAPHY 116

INDEX 121

INTRODUCTION

deregulation, and airport aid. However, where is the difficulty of talking sense about anything fundamental?

After all, most of us have considerable personal experience with air passenger transportation. We have been air passengers. We have visited airports, both as passengers and as people meeting passengers. We have made many trips, traveled to many places, seen with our own eyes. We have, so to speak, experienced the reality beyond the words. If that doesn't qualify us to talk sense, we may protest, nothing does.

Yet personal experience is not always trustworthy. Transportation provokes observational errors. Perhaps these arise from the problem of relative movement. Some of our earliest memories are of night walks as children when we were "followed" step for step by the moon. We gaze out the windows of railway cars and our senses tell us that the station is moving. We speak of the rotation of the earth by saying that the sun is rising.

Experienced travelers look with disbelief on airline claims of low load factors. "Why," they say, "I haven't been on a flight in weeks that wasn't almost full. That low load factor stuff is just company propaganda." But consider for a moment: if a plane flew completely full of passengers on one segment and completely empty on the next segment, it would average a 50% load factor; yet every passenger would experience a completely full plane, a 100% load factor. There would be no passengers on the empty plane; therefore no passenger would be able to report seeing an empty plane.

There will always be more passengers on board to report a full or nearly full flight than one that is empty or nearly empty; how could it be otherwise? To take a proper survey of the percentage of seats that are filled (which is what *load factor* means), one needs to take a survey of seats, not one of passengers. To understand load factors, one needs to be a seat, or an air transportation analyst, or at the very least, more sophisticated than to accept that seeing is believing.

This book is about the most fundamental aspects of air passenger transportation, that is, about passengers, air service, what makes good or bad air service, the substitutes for air service, and the major controllable factors that induce or discourage trips. This book is about the difficulties of talking sense about these things. It is about how, even though many people have never flown, there are more passengers than people. It will make clear how our language of spatial

metaphors hinders our thinking about the time-rich subject of personal transportation.

The fundamental aspects of air passenger transportation that are often obscured are these: (1) it is inconvenient, although the best we presently have; (2) its basic unit of choice is the round trip, (3) which has critical dimensions measured against daily and weekly time cycles and (4) which is purchased not for itself, but for the sake of something else. Further, the round-trip decisions are: (5) only partially reducible to economic terms and (6) form their own best substitutes through changes in their time dimensions, so that (7) large percentage changes in passengers may occur in response to changes in round-trip convenience, including (8) not only airport-to-airport aircraft scheduling, but also local airport accessibility and other factors.

The difficulty in seeing these fundamentals of air passenger transportation, or even seeing that they are fundamental, is caused by major semantic problems: an overreliance on unsophisticated personal observation, an unwary use of imaginary plurals, a key word with multiple meanings, limitations imposed by a language that deals awkwardly with time, a confusion of decision-making patterns, the limitations of what sociologists call "functional" as opposed to "substantive" rationality, a fascination with counting what is easily counted rather than measuring what is important, and in general a failure to look both at and beyond the words we use to discuss air passenger transportation. All of these difficulties, murky as they appear, will be clarified in the chapters that follow.

PART ONE

THE SEMANTICS OF AIR PASSENGER TRANSPORTATION

2

How Many Passengers Are You?

In 1980 I was one passenger, ten passengers, eighteen passengers, thirty-six passengers, forty-two passengers, fifty-five passengers, seventy-two passengers, and ninety-four passengers. Each of these statements is true.

I was one passenger in the sense that I was a person who traveled by air in that year. I was eighteen passengers in the sense that I made eighteen round trips. I was forty-two passengers in the sense that on forty-two different occasions I entered and exited the system of a different carrier. I was seventy-two passengers in the sense that on seventy-two occasions I was on board an aircraft when it took off from one place and landed at another. I was ninety-four passengers in the sense that I made ninety-four separate entrances and exits from airport terminal buildings. "Look at all the people; I wonder how many are passengers and how many just work here or are visiting."[1]

I may travel more than the average American, but my situation is by no means unusual. Both the Civil Aeronautics Board (C.A.B.) and the Federal Aviation Administration (F.A.A.) publish figures that, although differing from each other, show total annual passengers greater than the United States population.[2] Denver had 20,779,635 pas-

1. See Appendix A for proof and details.

2. For example, 296,132,661 passengers enplaned (F.A.A.); 382,031,280 true origin-destination passengers (C.A.B.); 433,834,500 on-line passengers (C.A.B.); all in 1979 vs. a population of about 220,000,000 (Bureau of the Census).

sengers in 1979,[3] but an estimated metropolitan population of only 1,584,000.[4]

Now, being by and large intolerant of obvious contradictions and messy intellectual exercises, we reassure ourselves all too quickly that these are merely different ways of counting the same thing. "Passengers are passengers; there are just many different ways of counting them." Thus reassured, we find it easy to dismiss the messiness as something only experts need to worry about.

However, there is a problem here that must be attacked with more vigor. A discrepancy in the meaning of *passenger* that allows my air travel in 1980 to be counted alternatively as one passenger, ninety-four passengers, and at various levels between, is too great to be ignored. Differences of this degree are not merely technical. Unless we know more, we run the risk of confusing one meaning of the word *passenger* with another and projecting this confusion into our decision-making deliberations about air transportation matters, possibly to our great regret.[5] Our task, then, is to go beyond the similarity of terminology, to find what is "out there" to which these terms refer.

Semanticists make an important distinction between the intensional, or "dictionary," meaning of terms and their extensional, or "operational," meanings.[6] An intensional definition of *passenger* would be *a person that goes on a trip in a public or private conveyance.* This type of definition, made up of words about other words, does not automatically lead us to the various meanings of a term. An extensional definition, on the other hand, points to what is meant – there's one over there, there's another – or describes what one must do to find it. This type of definition leads us to distinguish the meanings from each other, because the operations specified to find and count the different kinds of "passengers" are themselves distinct.

For example, finding "passengers" in the sense of persons who have taken one or more trips in the past year could be approached by questioning everyone in a door-to-door survey. This would involve no duplication of persons, and the number of "passengers" must be

3. See Appendix B.
4. *Sales Management Survey of Buying Power,* July 28, 1980.
5. The dangers of identification ("a passenger is a passenger") and projection of beliefs based on an uncritical acceptance of verbal maps to the world of not-words are highlighted by semanticists; e.g., Korzybski (1933), Hayakawa (1963), Johnson (1946).
6. For a discussion of operational definitions, see Bridgman (1927), Frank (1949).

less than the population by the number of "no" replies received. To find "enplaned passengers" we would identify all those who boarded a flight excluding those who may simply have reboarded after stepping off at an intermediate stop to stretch their legs. We would not be surprised to find more "passengers" of this type than of the former type, since one individual could be counted many times in a year. To find "on board passengers" we need only count the number of seats filled before each takeoff. The annual number of such "passengers" will be still higher.

Another set of extensional definitions of "passengers" has nothing to do with counting heads; rather, it is based on counting tickets. The C.A.B. collects a ten percent sample of tickets from the air carriers, which is then analyzed to produce various "passenger" statistics. A ticket consists generally of a separate leaf (or coupon) for each aircraft boarded. The separation permits counts of "coupon passengers" to be developed. By combining consecutive coupons going in the same direction on the same airline, statistics can be developed to show "on-line passengers." By combining all consecutive coupons going in the same direction, statistics can be developed on so-called true origin-destination passengers. Each of these is a separate measure; all they have in common is the ticket as a source document. Also, on all round-trip tickets and on many one-way tickets these measures yield more "passengers," sometimes many more, than tickets. Since we generally think of a ticket as representing a single "trip," then we have measures here that yield more "passengers" than "trips." The extent to which this result defies common sense is an indication of how far the meaning of the word *passenger* may depart from our usual expectations.

Reasoning on the basis that "a passenger is a passenger," then, leads to confusing "people" with "passengers" with "tickets" with "coupons" with "occupied seats" on aircraft. Clearly, however, a person is not a ticket, and a ticket is not an occupied seat: these are different things, and what is true of one is not at all necessarily true of the other. Indeed, persons differ from tickets and tickets from seats in almost all respects.

Of these confusions the one between "passengers" and "persons" is the most insidious. It is an attractive identification to which all elements of the industry and its observers are known to succumb.[7] What

7. See Appendix C.

we are counting is the number of trips, or segments thereof, but by uncritical use of the term *passenger* we are led into attributing the characteristics of persons to the numbers.

The term *passenger* cloaks the repetitive nature of trips. When an airport manager reports, "Last year we had 120,000 passengers," and we think of 120,000 people, we miss entirely that perhaps 10,000 persons made an average of six round trips each.[8] There were not 120,000 "persons" making 120,000 separate one-way trips. There were only 10,000 persons making an average of six round trips each. These are fundamentally different views about what is going on out there. The one cloaks, as the other reveals, the repetitive nature of trips.

Similarly, identification of the term *passenger* with the concept of "person" hides the serial and duplicative nature of many of our figures. Note that on my first trip in 1980 I became, or generated counts of, six enplaned passengers and fifteen on board passengers.[9] These counts arose from what was essentially just one round-trip decision on my part. There never were six enplaned persons or fifteen on board persons; I was just going from place to place and being counted over and over again as I went.

Anthropologist, linguist, and insurance executive Benjamin Lee Whorf would have described our counts of "passengers" as *imaginary plurals* and attributed our difficulty with them to the structure of our particular language.

> In our language . . . plurality and cardinal numbers are applied in two ways: to real plurals and imaginary plurals. . . .We say "ten men" and also "ten days." Ten men either are or could be objectively perceived as ten, ten in one group-perception – ten men on a street corner, for instance. But "ten days" cannot be objectively experienced. We experience only one day, to-day; the other nine (or even all ten) are something conjured up from memory or imagination. If "ten days" be regarded as a group it must be as an "imaginary," mentally constructed group. . . . When we speak of ten steps forward, ten strokes on a bell, or any similarly described cyclic sequence, "times" of any

8. Six round trips times 10,000 persons yields 120,000 one-way trips.
9. See Appendix A.

> sort, we are doing the same thing as with "days." *Cyclicity* brings the response of imaginary plurals.[10]

Our term *passengers* is especially slippery. When we take a head count on one aircraft before it takes off, we are dealing with an objectively perceived group, for example, sixty passengers. When we add this count to another taken the next day in an aircraft perhaps going in the opposite direction, we slip over into an imaginary group. We add the fifty passengers from the new count to the sixty passengers from the previous count and overlook that some of the heads we count may belong to the same bodies one day later. The more such counts we add together, the more duplication there is, and the more misleading the identification of *passenger* with *person.*

Whorf noted that imaginary plurals, while common to most European languages, are not universal. In Hopi, for example,

> . . . there is a different linguistic situation. Plurals and cardinals are used only for entities that form or can form an objective group. There are no imaginary plurals, but instead ordinals used with singulars. Such an expression as "ten days" is not used. The equivalent statement is an operational one that reaches one day by a suitable count. "They stayed ten days" becomes "they stayed until the eleventh day" or "they left after the tenth day." "Ten days is greater than nine days" becomes "the tenth day is later than the ninth." . . . The Hopi language has not laid down any pattern that would cloak the subjective "becoming later" that is the essence of time.[11]

No tool is perfect for everything. Our language permits us to add separate perceptions over time into plurals. It makes no distinction between spatial aggregates (two fence posts) and time aggregates (two Saturdays). Having but one pattern to cover both, it confuses them. It provides no warning that we are dealing with repetitive events and that the plurals of temporal events are imaginary plurals. Therefore, we fail to see that *ten passengers* is used to signify both ten all counted at the same time and one counted at ten separate times.

10. Whorf (1941).
11. *Ibid.*

The practical way out of this difficulty is hardly to learn Hopi. Rather, we must use our language with more care. It is much like using a knife blade to do a screwdriver's job: one must be careful not to slip and not to put so much weight on the instrument that it breaks.

Linguistic habits are hard to break. The force of such habits is felt most keenly nowadays in our struggle to rid our language of sexual bias ("flight attendant," "Mr. and *Dr.* Jones," "chairperson"). But this difficulty is child's play, the work of a decade or two, compared with the bias built into our language structure regarding space and time. We are probably stuck with it. My only suggestion, and it is one limited to the purpose at hand, is to repeat over and over until the thought is second nature something like: "there are not 120,000 passengers; there are just 10,000 people running back and forth."

3

Diurnal Is Not A Dirty Word

Nothing about our lives is more obvious than their basis in a daily cycle. We sleep, awaken, perform our morning ablutions, eat breakfast, go to work, eat lunch, resume work, eat dinner, switch to evening activity, relax, and once again fall asleep. This daily cycle, which is related to the sun, undergoes minor modifications from weekly and monthly time cycles (both related to the moon) and annual cycles (once again related to the sun). These cycles give the beat to our lives.

Yet, our language is poor in time-sense words. One standard reference on the English language[1] subdivides *time* into 34 categories covering 17 pages of vocabulary. The same volume subdivides *space* into 146 categories covering 107 pages of vocabulary.

Whorf notes that, in contrast to the Hopi, we tend to objectify time and discuss it through spatial metaphors. We speak of a "point" in time, a "lost" hour, and a "big" day. When we speak of a "heavy traveler" we do not mean a fat passenger; it is only our way of using metaphors to talk about temporal events. As Whorf points out, "The non-metaphorical terms in this field, like early, late, soon, lasting, intense, very, tending, are a mere handful, quite inadequate to the needs."[2]

As individuals, certainly, we know, we feel, and we plan in terms of daily cycles. We know about getting up, and getting to work, about

1. *Roget's International Thesaurus,* 3d ed.
2. Whorf (1941).

peak hours and off-peak hours,[3] about business hours and leisure hours. In setting up appointments with other people, we expect them to observe similar daily cycles. However, we find it difficult to employ this knowledge in statistical analyses of air passenger data.

Diurnal means "having a daily cycle." It is derived from the Latin *diurnus* (of the day), which comes in turn from *dies* (day). *Diurnus* is also the root for the French *jour* (day), and our *journal*, both in the sense of an accounting day book and a daily newspaper. Significantly, *diurnus* is also the root for *journey*.

Historically, then, there was a sense of the day's cycle in a journey.[4] Today, however, the diurnal aspect plays no more part in that term's connotations than it does in those of such terms as *trip*, *ticket*, or *passenger*. The natural break points, or nodes, of our trips remain those between day and night. We plan to be back the same day, or to stay one night, or more, and we pack our bags accordingly. Our habits and needs are still there; they have just disappeared from our analytical vocabulary.

The standard method of evaluating air service used by the bureaus of the C.A.B. involved in such matters is called the "Quality of Service Index." It has been employed in case after case before the C.A.B., both by the Board's bureaus and by air carriers. Yet it is only a disguised representation of available seats constructed of the number of flights multiplied roughly by the size of the plane and discounted for intermediate stops. It does not take time into account.[5]

This particular quality of service index is used so frequently by aviation analysts that it is referred to as the QSI. The F.A.A. acknowledges it.[6] Yet it takes the final step needed to dismiss the diurnal nature of human life from the analysis of air transportation. Passenger transportation is analyzed without regard to when the planes leave or arrive, when our work is to be done, or how many nights away it will require.[7] Spatial metaphors reign supreme.

The QSI has banished time.

3. The most experienced air travelers apparently even know about and take advantage of off-peak air travel times. Landrum and Brown (1968).

4. In ancient Rome foot travelers had the right of way during the day, chariots and cargo at night. Carcopino (1940).

5. See Appendix D.

6. Metropolitan Washington Airports Policy. See Appendix E.

7. See Appendix E.

4

Leather Helmets Are Old Hat

There may have been a time when flying was engaged in primarily for its own sake, flying for the joy of flying. That era presents itself in my conception, perhaps under the influence of glamorous advertisements and romantic histories, as one when style was everything. Leather helmets, goggles, and silk scarves were *de rigueur.*

Most flying today is done for the sake of something else. It is not done for its own sake, nor even just for the sake of getting somewhere else. We fly for the sake of whatever it is that is served by our getting to that somewhere else, and that reason determines whether we are more likely to go in business suits, street clothes, or leisure wear.

The common variety of short-form airline survey that asks merely whether the purpose of our trip is business, personal, or both of the above, imposes a statistician's straitjacket on the delightful variety of the human spirit. Given free rein to express reasons, travelers report trips to visit regional offices, parts depots, training schools, clients, and suppliers; to appear at hearings, seminars, and directors meetings; to see children in college and relatives in hospitals; to visit friends and in-laws; to attend sports events; to perform surgery; to supervise branch stores; and to take vacations. One professional man we interviewed reported monthly air trips to another city to visit his mother-in-law.[1] We have even discovered travelers who flew more

1. See Appendix F.

than 1,000 miles on a change of venue.[2]

Things done for the sake of other things become means to an end. Decisions about them are made in the goal-directed pattern where, once a goal is accepted, the only question is how to achieve it. Looking at air trips this way exhibits what sociologists[3] call *functional rationality*, the ability to figure out how to do something without considering whether it is worth doing.

Thus, when asked why we are making a trip we may answer quickly in terms of the immediate function it serves. "I went, because I had to see a client."

Looking primarily at the function of a trip in terms of an unquestioned goal, we see the trip as necessary. The concept "for the sake of" undergoes a psychological transformation into the quite distinct concept of "required." Unlike the good old days, when one might have gone for a spin in the sky because one felt like it, today we usually feel we travel only because we have to.

When air service analysts limit themselves to a narrowly functional view, they fail to recognize the power of changes in round-trip convenience to affect the number of trips that will be made. If a traveler *must* make the trip, then convenience may affect which particular flights of which carriers, perhaps even which mode of transportation, will be used, but it will not affect whether the trip will be made. The analyst with this view tends to see the number of trips as fixed.

In a deeper sense, however, all trips are discretionary in that we could choose not to make them – if we were willing to accept the consequences. To see this we must look beyond the immediate function or purpose to question whether that function or purpose itself is worthwhile. "Yes, but do I really have to see my client? What will happen if I don't?" This approach exhibits *substantive rationality;* instead of regarding a travel decision merely in terms of its function of satisfying a need to be somewhere, it questions the substance of the need itself.

Analysts who have freed themselves from the limitations of functional rationality are better able to appreciate the reasons for fluctua-

2. Because of the need for the change of venue during the summer season, the judge moved the trial near his summer home. We presume this qualified his travel as "business" for Internal Revenue purposes.

3. For example, Mannheim (1940).

tions in traffic. For example, the annual rate of Norfolk-Baltimore true O&D passenger traffic (read "one-way trips") fell from 41,210 in 1969 to just 1,880 in the fourth quarter of 1975, and then rebounded to 47,240 by the third quarter of 1977 in line with large changes in airline scheduling.[4]

Analysts limited to the functional view seek to explain the traffic fluctuations by reference to (1) changes in the need to go (for example, plant closings) and (2) trips diverted to other modes of travel or routings (for example, surface travel or air travel via Washington). "Where did the people go?" they ask when the traffic falls. "Where are all these people coming from?" they ask when the traffic grows back. They see the changes in service, but because they identify "people" with "passengers" with "necessary trips," they do not see airline schedules as the primary cause of the fluctuations in passenger traffic.

Yet the evidence shows that the primary explanation for the drop is trips postponed and cancelled because of changes in the convenience of making a trip.[5]

Of course, there never were 41,210 "people" who "had" to make trips; probably just 7,000 who averaged about three round trips each with good service. That most would refuse to go at all, and some drive or fly via Washington, for three months when service virtually disappeared is no wonder. Many of the trips were no longer worth the increased effort.

In other words, even though the answers of passengers and the analyses of statisticians may exhibit primarily functional rationality, what actually happens in the marketplace exhibits substantive rationality. Whether the trips are worth the effort will determine how many are made.

4. See Appendix G, page 1.

5. See Appendix G, page 3, reporting such postponements and cancellations even while some flights were still offered.

5

Is Your Time Worth Anything?

Some of the factors that influence air transportation decisions are easily reduced to dollar values; for example, ticket prices, aircraft costs, fuel costs, salaries, and airport construction and maintenance costs. Although variable from place to place and time to time, each of these goods and services has a market in which it is exchanged at known dollar values. These values can then be combined and allocated, not entirely without doubt and debate, of course, to produce estimates of joint costs in action, such as the cost of operating a particular passenger flight.

Placing a dollar value on air passenger time is much more complex. Although we have moved far into the "economization" of human life and away from tradition and other decision-making values, we do not yet view human time entirely as an economic good, divisible, and worth so much per minute or hour. Even if we sell our time to make a living, and even if at home we refuse some tasks "because it would be cheaper to hire someone" to do them for us, we still make many decisions about our time without reference to its economic value. We look in one way upon our time at work in a business, in another at such societal events as weddings and funerals, and in still another while on vacation. Yet, we have come an extraordinary psychological distance from people who make no such distinctions.

> Primitive peoples do not "go on vacation," not because their work is so interesting that they never tire of it, nor because they have to work constantly to keep alive, but

> because the distinction between two kinds of time is foreign to them.[1]

A self-employed person, such as a lawyer or consultant, whose time is fully salable at a fixed price per hour could, admittedly, calculate the cost in foregone income of an unpaid business call. One step removed, an employee's time during business hours could be calculated by its cost to the employer, including taxes, benefits, and other overhead. So far, so good, but then come serious problems. How do we value the time of a business executive after hours or on vacation? A housewife traveling to her former home town to handle an estate problem? A college student coming home for Thanksgiving? An elected official returning to call on constituents?

Some decision-making patterns offer more resistance than others to economic quantification. Goal-directed decisions, particularly business decisions where the goal is the "bottom line," yield easily. If a decision can be put into the goal-directed form, an economic value can often be calculated. For example, if the elected official assumed for the sake of decision making that the sole purpose of visiting constituents was to get elected, then one could compare the visits with what it might cost to use other methods taking less time, such as newsletters or television. Which approach the official took would then reveal something about the limit, at least, on the elected official's value of time.

A responsive decision, one in which we do what we do because it is the expected response to a situation, such as attending a wedding or funeral, resists economic quantification. So do absolute decisions in which we do what we do because we like to do it. For example, how should we calculate the value of time we put into a hobby?

The resulting commensurability gap between airline costs and passenger time is enormous, and provides another good reason for deregulation of airline route, service, and fare decisions. Because economists and regulators understandably tend to count what is countable, rather than what is important, regulatory decisions focus almost hypnotically on airline economics and treat traveler convenience and necessity as a thing apart. How does one weigh convenience against profit in the regulatory scales?

1. Diesing (1962).

In almost thirty years of practice before the C.A.B., I recall participating in only one case where the decision hinged on the *economic* value of passenger time against the cost to the air carrier, or at least where the judge made a point of the comparison. This happened in a case where we had estimated public benefits at $1,638,000 and airline costs at only $130,500. The judge noted that the "time cost and lodging cost savings estimates are useful general guides to the understanding of the relative values being weighed against each other" and found in favor of the civic parties.[2]

Nevertheless, contrary to expectation, and mostly unnoticed, there is general agreement on the value of passenger time. Different studies over the last thirty-five years, even though conducted in different ways, have established that air traveler time is worth more per hour on the average than that of the population as a whole, and has increased from something like $6.00 in 1956 to something like $15.00-$20.00 in 1980.[3]

Time, of course, is not only worth different amounts to different people, but also varies in worth according to the time of day for any one person. Thus, most passengers value their sleep in the morning more than their leisure in the evening (for example, preferring a 6:00 A.M. to 9:00 P.M. same-day trip over a 5:00 A.M. to 8:00 P.M. trip). On the other hand, the value of time lost on a business trip by not being able to arrive at one's destination early in the day is not recaptured by taking a late flight that leaves long after the end of business hours.

One thing is very clear: going past the diurnal nodes greatly increases travel costs. That is, whenever passengers stay another day, there is a significant increase in costs for the extra night. These costs arise not only from lodging expense, but also from the additional meals that must be eaten out, the calls home that accompany longer trips, the clothing, other belongings, and luggage, that must be taken along, and the increased planning time needed for a longer trip. Thus, traveler time and expenses, apart from ticket costs, must be considered both in terms of traveler hours and in terms of nights away.[4]

2. Philadelphia-Rochester/Syracuse Case, C.A.B. Docket 20472 (1975).
3. See Appendix H.
4. See Appendix I.

6

The Magical Instantaneous Transporter

Historical perspective has its place. So does futuristic perspective, even fantasy. When a backward and a forward look are combined, they have a double power to put new perspective on the here and now, to jolt us out of our current abstractions of a world that is too much with us.

The here and now of air passenger transportation is all too familiar. Service consists of flights operated in various kinds of propeller and jet aircraft, leaving at different times of day, with differing numbers of stops and intermediate connections. The range from fastest to slowest service, from nonstop Concorde to multi-stop propeller connections, seems very great. Yet, just as all the colors of visible light make up but one segment of the electromagnetic spectrum, so our current variations in air service quality constitute only a narrow band of the intercity passenger transportation spectrum.

If we look far enough back, we find a time when the only way to get from one place on earth to another was to walk. Deserts, mountains, and oceans were absolute barriers. Ages later came rafts, then horses and propellable boats, and then in rapid succession, chariots, coaches, fast sailing ships, steamboats, trains, automobiles, and airplanes.

In the beginning the truly long-distance travels were migrations spanning generations. Many who set out never arrived, and the travel was essentially a one-way passage, nothing at all like our trips of today. By the thirteenth century even enormously difficult overland trips could be made within the span of one life. Marco Polo set out

from Venice in 1271 for Kublai Khan's court (in what is now called Beijing), arrived in 1275, left in 1292 after a stay of seventeen years, and was back home in Venice in 1295. Since he had to spend seven years on the road, who can blame him for staying seventeen years once he had arrived?

Two hundred years later Christopher Columbus was able to complete four voyages of discovery to the New World and back in just over twelve years (August 3, 1492 to November 7, 1504). His first round trip, which was also the quickest, required exactly thirty-two weeks. Just over eighteen weeks of it were spent going and returning and just under fourteen in the first recorded version of Caribbean island hopping. In the modern version the tourist can make the trip with one day for going and coming plus six days in the sun, to get the weekly tour package rate, while the rushed business traveler can make a comfortable one-day New York-San Juan-New York round trip (7:00 A.M. - 9:09 P.M.) and have almost a full business day in San Juan (10:30 A.M. - 5:45 P.M.).[1]

There is a basic principle at work here: *the longer it takes to get somewhere, the longer one must stay to make it worth the effort.* When the fastest way to cross our country was the stagecoach, a stay of less than a month was almost unthinkable. Today the typical traveler finds it difficult to put a whole month together to spend in any one place. If one's mother lives upstairs, then she might be seen several times a day, but for only a short while each time. If she lives in the old country, a visit once a year would be a luxury, a stay of less than a week a shame and a waste.

But what if the progression of ever-faster means of transportation took a sudden spurt? What if, perchance, some enterprising genius invented a seemingly magical and instantaneous way of transporting persons between one marvelously updated version of a telephone booth and another? That is, what if all one had to do to be transported from one place to another was find an empty booth, dial a number, give one's credit card account, and then, on getting the appropriate signal, push a button to cause dematerialization here and rematerialization there?

This invention, please note, continues the historical trend of transportation development. It is faster. It is more convenient. In

1. *Official Airline Guide,* August, 1980.

spite of its initial reception, it is not magical, for it extracts a toll. Further, it is not instantaneous, for one first has to find the box, wait one's turn, dial the number, pay the toll, and only *then* push the button, after which the trip is rather speedy. Following the first burst of enthusiasm, the device is dubbed the "MIT." Far out though it now seems to be, the MIT is not even the real extreme of our transportation spectrum: that would be costless teleportation at will.

What consequences attend the MIT? First of all – and it is a blessing – the term *passenger* falls into disuse. Most of us go from place to place so frequently that keeping track is almost pointless, truly a matter of concern only to the system engineers.

The average number of nights away per trip declines dramatically. Indeed, some busy people visit ten or twenty far away places in a day, and still come home to sleep in their own beds. Theatre buffs from Philadelphia see one "evening" show in London, another in New York, and still spend the night in their own beds. Even greater time-zone changes are fitted into busy schedules. Anyone with the yen can spend a "morning" on the Great Wall of China and still get back home that evening.

It is soon obvious that the MIT is no boon to hotel owners. Indeed, as the frequency of trips goes up, their average duration goes down. "How much easier it is to travel without baggage!" Luggage manufacturers suffer. More MIT's are placed where we need them, right on our block and right near the attractions we wish to visit; we don't even need taxi money. Other forms of passenger transportation disappear, except a few kept running for the nostalgia crowd. For those who can afford it, a MIT closet off the main hall at home is handy. It makes it easier to mit home to grab a snack or check the mail.

The personal, social, economic, political, and legal consequences of mitting about are enormous. Just as private automobiles once reduced the gap between big and small towns and changed the business habits and sexual mores of America, so mitting changes the world. Many old laws and customs prove unenforceable. Smuggling grows to such proportions that the term and the concept must be abandoned. Parental efforts at control through taking the mit keys away prove futile. A new structure of society evolves to take advantage of the new means of transportation. The old, inflexible, time-consuming forms of travel, except for a few overromanticized museum pieces,

are forgotten. We are too busy with our new way of life to take the time to study and understand how it really was back in the air age.

7

The Invisible Transportation Substitute

Economics teaches that the degree of variation in demand relative to changes in price for any good or service is in large part related to whether it has any substitutes. If the substitutes are close and many (as for macaroni, for example), changes in price will lead to large changes in demand. If, on the other hand, close substitutes are less available (as for cigarettes, for example) demand will change less relative to price. *Price* as used here should be understood to include the total cost to the purchaser of obtaining and using the good or service and not just the store, sticker, or ticket price.

Air transportation is usually viewed as having few close substitutes, except on the shorter hauls, where cars and trains may qualify. Less complete substitutes, usable in some instances, are provided by telephone and mail services. Still less complete substitutes include such actions as opening branch offices, abandoning business in one place in favor of business in another, and building a recreation room rather than taking a vacation.

The closest substitute for air travel is almost always overlooked by aviation analysts, because it is invisible. This substitute is *a change in the time dimensions of travel.* It is invisible because changes in time dimensions can no more be seen than time itself; such changes can only be reconstructed or imagined as unfolding alternatives.

For example, consider a traveler – an auditor, a relative, a politician – who feels a need or desire to spend twelve days a year in a distant community. One way to do this would be to make *three trips* a year (one every four months) and stay *four days* on each visit.

However, if the costs were lower (ticket price down or convenience of service up), the same twelve days could be packaged into *four trips* (one every three months) of *three days* each. Such a change in the time dimension of the travel results in one-third more trips ("passengers" in airline parlance) with no increase in travel in terms of time in the other community. The traveler still stays twelve days.

We may now broaden this small part of the transportation convenience spectrum by assuming on the one side that the quality of service gets much worse, and then on the other side that it gets much better. Thus, if the service on the trips just described happened to consist of multi-stop flights on slow aircraft, worse service could require two changes of plane and an overnight stay en route. To achieve twelve days at the final destination, the traveler might now cut back to two trips of six days each, or even in the extreme to one annual trip of twelve days. On the other side, with an improvement in service to frequent nonstop flights, the traveler might well increase the trips to six a year of two days each, or even twelve a year of one day each, to produce the same total of twelve days at the destination. The percentage changes in trips, the variations in "passengers" are now very large, although the number of days at the destination community has remained constant over these alternatives.

There is abundant proof that changes of this sort take place. Analyses have revealed repeatedly that the number of passengers (trips) in any given group of city-pairs goes down as the convenience of making a round trip declines, and goes up as that convenience improves.[1] The number of nights away for trips of any given distance, however, *increases* as convenience decreases.[2] One study even demonstrates that as ground distance from the local airport increases (thereby reducing round-trip convenience) residents make fewer trips but compensate by a longer average duration of trip, so that total time spent away varies only slightly.[3]

This reciprocal retiming of trip frequency and trip duration generates a whole series of invisible substitutes, thereby permitting demand (as represented by the number of passengers) to vary continuously relative to price (or cost, of which the most variable component is usually the passenger's time and expense associated with changes

1. See Appendix J.
2. See Appendix K.
3. See Appendix L.

in the convenience of making a round trip).

There is nothing mysterious about this finding. It is in complete accord with expectations. However, to discover it one must avoid four semantic traps on the way:

Trap #1 Passenger equals person. Unless this trap is avoided, there is no way to see that one person becomes many "passengers."

Trap #2 Passenger equals trip. Unless this trap is avoided, there is no way to see that the usual unit of choice is the round trip and that one round trip may generate many "passengers."

Trap #3 Service equals flights (even if adjusted for aircraft type and intermediate stops). Unless this trap is avoided, there is no way to see the convenience of making a round trip and how it influences a person's travel plans.

Trap #4 Travel equals trip. Unless this trap is avoided, there is no way to see that travel can be packaged into varying numbers of trips of different durations.

By avoiding these traps we bring the invisible substitute and its workings into full view. We see that the number of passengers depends on how persons package their travel into trips of varying frequency and duration in response to the convenience of making a round trip.

8

Can You Get There And Back?

To perform sound market analysis and sociological research we must look at persons as deciders. Nothing less will do. We must focus on the decision the deciders thought they were making, look at it from their point of view, and take into account the factors that affected them. This requirement distinguishes market analysis and sociological research from the purely physical sciences.

In air passenger transportation the immediate decision faced by the traveler is generally (admittedly not always) whether and how to make a particular round trip, with postponements and trade-offs between trip frequency and duration among the possibilities. A series of such decisions may give rise to general guides or *travel policies.* Both the individual trip decisions and the travel policies are influenced by feedback about round-trip convenience and the relative importance of travel.

It quickly becomes apparent that the relative convenience of making a particular round trip depends primarily on the schedules offered by the airlines. It is also apparent that there is no ready clock or scale of round-trip convenience, no industry standard, no agreed-upon or easy way to measure it.

Most analysts go astray at this point. They cease to look at schedules the way a prospective traveler would. Instead, they start counting them. Prospective travelers do not normally count schedules; they just look for ones that go when they want to go, give them enough time at their destination, and come back when they want to come back. Unless their return plans are indefinite, or they have an

innate suspicion that the flights they pick may be cancelled, they typically could not care less how many other flights are offered.

When I first faced this problem as an analyst in 1952 I realized that one might spend a lifetime constructing a formula that reasonably matched the way prospective passengers take schedule data into account. Somehow, in spite of, or possibly because of, being the son and nephew of certified public accountants, I knew that a rough estimate of what was needed would serve better than an exact measurement of what was not. Therefore, I eschewed counting up the number of flights, counting the number of seats, or calculating the elapsed flight times. Instead, I looked for something very quick that would represent, no matter how roughly, the convenience of making a round trip.

The most obvious requirement was that the formula had to cover at least one service going and one service returning. The next most obvious requirement was that it had to allow for prospective passengers planning to start from each end of the city-pair. What might look good, for example, to a Dallas resident planning a trip to Chicago, such as an early morning flight, might look like a poor choice to a Chicago passenger planning a return from Dallas. Therefore, at least two flights in each direction had to be taken into account.

Following the path of least effort, I tried the following formula: for each direction in the city-pair take the two flights with the least stops; then allow the flight with the second-least stops of the four to represent the quality of the round-trip service. This formula grouped Dallas city-pairs (for it was Dallas that was being analyzed) into four categories based on this second-best service: nonstop city-pairs, one-stop city-pairs, two-or-more-stop city-pairs, and city-pairs without single-plane service.

Astonishingly, it worked. With the further separation of the city-pairs into those over and under 150 miles, each such service group showed excellent correlations with independent indicators of traffic demand (such as telephone calls in the city-pair, hotel registrations, and a population-distance formula). Most significantly, however, the statistical analyses showed that each successively poorer service group generated fewer passengers relative to the independent measures of potential demand. That is, given similar demand, nonstop service produced more passengers than one-stop service which, in turn, produced more than two-or-more-stop service. This was so good that

the head of the firm for which I worked at the time sent me off to check the results with a statistics professor at Columbia.[1] The technique was used in a study for Denver in 1953 and in studies for other cities over the next few years, both by my old firm and by another one for which I was a part-time consultant as I tried my luck in the oil and direct mail businesses.

In 1963 I returned to consulting on a full-time basis and took a second crack at trying to measure the convenience of making a round trip from the passenger's point of view. Little advancement had been made since 1952, but then it must be recalled that in those days there was no quick reference directory listing of schedules, such as we have today, but only a collection of individual carrier timetables laid out in the immemorial manner of railroad timetables, a footnoted vertical display of each flight's itinerary. If one wanted to find all the flights from one city to another, one had to consult many pages and decipher the varying timetable styles of different carriers.

Unlike the first method, which any analyst could grasp in a few minutes, the next step in complexity created a technique which almost nobody learns to use without a couple of days' hard work. The new technique still started with the proven step of taking the best two services in each direction, but these were now more closely defined in terms of component scores for time of day (preferably one service in each direction in the early morning and another in the late afternoon or early evening), equipment type, stops, connections en route, connecting time, and circuity. The first such study performed was for Louisville, with much finer classifications and correlations than had been possible with the earlier methods. Refinements have been added ever since as needed, so that the technique now includes component scores for additional flights during the day (once the peak hours are covered), distance penalties (instead of mileage separation), surface segments, recurrent connections (such as occur at Atlanta and Chicago), and commuter schedules.[2]

This technique of measuring the convenience of making a round trip in any city-pair has been used in dozens of studies.[3] My firm, which began consulting directly for civic clients in 1969, rather than

1. Dr. Samuel B. Richmond, now Dean of the Owen Graduate School of Management, Vanderbilt University, who wrote several articles on the subject.
2. See Appendix M.
3. See Appendix N.

in association with another firm, calls the technique the MacNeal Air Service Scale. Other consultants who use it or a variation thereof understandably have referred to it in other ways.

The service on the scale that comes closest to the round-trip convenience provided by the magical instantaneous transporter is shuttle service of the type offered on the New York-Boston and New York-Washington runs. No reservation is required, tickets are sold aboard the aircraft; and should you arrive at the airport on time for the hourly departure only to find the seats already filled, a new aircraft will be rolled out for your use. This best service scores out at minus three on the scale.

The worst service I have experienced personally as measured by the scale, and therefore closest to the stagecoach side of the spectrum, began as an early A.M. flight (4:05 A.M.) from Portland, Oregon, to Seattle, thence by car to Vancouver, with time left over to visit Stanley Park, thence one-stop (Winnipeg) to Toronto, thence nonstop to New York, where it was necessary to rent a car to drive to my home in Wayne, Pennsylvania, near Philadelphia. All this was during an airline strike that disrupted normal transcontinental service in the United States. The score on the scale was 40.[4]

One of the useful features of the MacNeal Air Service Scale is that it is calibrated so that each step on the scale represents an equal percentage change in air passenger traffic, generally around fifteen percent. Thus, from the worst air service to the best, we know reasonably well how much any factor or combination of factors must change to yield a given change in passenger traffic. The scale represents a demand curve, not against price, which is what one sees usually in economic analyses, but against the convenience of making a round trip by air. Because of regulation and other factors, there has been little price competition in the industry. Therefore, the scale captures the essence of variations in the cost of air transportation to the passenger. This is why it has worked so well in representing the actual trip decisions made by travelers and potential travelers.

4. I do not hold the record for the worst service ever used and reported on the MacNeal Air Service Scale. That honor belongs to Henry A. Kallio, who accompanied me from Portland on the trip east, and then decided to try for an even worse score on the way back, at which he succeeded. Mr. Kallio now works for Continental Air Lines, which is known for innovative service ideas.

9

How Big Is The Market?

If demand for a good or service varies with its price, in the sense of its full cost, then the knowledge of how many units are purchased without data on the price is incomplete and potentially misleading. The sale of 50,000 cameras with self-developing film per year to a population of 150,000,000 would be unimpressive, unless we knew that this was the sale of the early, bulky, expensive, messy, and time-consuming Polaroid model. As market analysts, we need data showing the costs to the consumer to appreciate how big the potential market really is. Then, if we anticipate reductions in size, cost, messiness, and picture-development time, we might forecast annual sales of millions of such cameras.

The same is true of air passenger markets. Just knowing the number of "passengers" in a city-pair without knowing the full costs affecting the convenience of making a round trip leaves us with incomplete information; all we have is an uncorrelated datum.

Indeed, air passenger transportation has, as we have already noted, some special analytical problems of its own. Even the question "How big?" is misleading. It is another spatial metaphor where we could better use a time-sense word. "How *often* is the market?" would be closer to the mark, but is not good English. Then there are the special problems attending any measurement of "size" in terms of the numbers of "passengers," because this term has many meanings producing many counts, but none, unfortunately, of round trips.

The closest we can get to a count of round trips starts with the so-called true O&D (origin-destination) passenger. True O&D is de-

termined by combining the coupons in a ticket going essentially in the same direction regardless of changes of plane and carrier. Adding up all the true O&D "passengers" produces a count of one-way trips.[1] Dividing the count by two yields an approximation of the round trips (approximate because not all trips are round trips). Unfortunately, deregulation of the industry threatens the loss of even these data. "Why," it is asked, "should not the airline industry rely on its own internal company-generated statistics as other industries do?" The question raises the interesting possibility that service improvements in the future will *reduce* the number of "passengers" each time a trip that once required two carriers comes to require only one.[2]

The best measure we have, then, of the trips persons make in any city-pair market is the count of true O&D passengers. However, the number of passengers on board the aircraft (which is a much larger number[3]) is the one that carriers must use for most purposes (planning seat capacity, putting meals aboard). Unless we are careful, it is easy to become confused.

I can understand readily why some airline analysts and executives trust virtually no "passenger" counts other than yesterday's "on board" figures. They have looked for so many years at "service" in terms of one-way seats and at "passengers" in terms of the grab bag of partial trips represented by on board passengers that the bigger picture gets lost. Several of these executives have admitted to me over the years that they do not believe their own analysts' claims that traffic increases will result from service improvements ("service stimulation" in the trade jargon), and that the analysts' claims are just made to please the C.A.B. and keep the airline from looking bad relative to others. I do not enjoy hearing others in the industry deny the fundamental effect of air service on travel habits. However, I have heard the denial so often that I have learned to live with it.

I have my own favorite examples of how "passenger" figures, even true O&D figures, taken by themselves are not to be trusted.

1. We can ignore the arbitrary conventions by which trips with multiple destinations are broken into one-way trips, as we can ignore the errors inherent in having only a ten percent ticket survey; these are minor difficulties beside the others that must be faced.

2. The loss of true O&D data would also make it far more difficult and expensive for any public observer to know what was going on, a condition that may not be healthy in view of the pervasive effect of intercity transportation on our economy and culture. But that is another subject.

3. See Chapter 2 and Appendices A and B.

The following is one of them.[4]

City-Pair Market	True O&D Passengers 1950	1964
Louisville-		
Indianapolis	6,696	5,290
Akron	1,188	960
Moline	330	1,570
Paducah	120	6,840

The 1950 data produce one ranking of these four Louisville markets; the 1964 data produce another. Which is nearer the mark as a measure of underlying demand? The combined data produce trend lines both up and down. Are they reliable?

As it turns out, almost every inference that one might draw from these data about demand in the four Louisville markets is false. Contrary to the passenger counts, Louisville-Indianapolis demand was not gradually declining; Indianapolis demand was not smaller than that of Paducah; Akron demand was not slowly declining; and demand in the Moline and Paducah markets was not growing as fast as indicated.

It is only when the quality of service as measured by the convenience of making a round trip is added to the table that one can see what these figures reflect about demand. I have also added a third year to make the picture easier to comprehend. (The lower the number for quality of service, the better it is.)

City-Pair Market	True O&D Passengers 1950	1958	1964	Service Quality 1950	1958	1964
Louisville-						
Indianapolis	6,696	15,801	5,290	1	1	3
Akron	1,188	3,582	960	5	5	10
Moline	330	925	1,570	12	11	10
Paducah	120	6,665	6,840	20	4	2

Now we can see that the passenger figures for 1950 reveal little about the relative demand of the four communities, because their

4. MacNeal (1966).

services were so different in quality. The Indianapolis market showed considerable growth through 1958, during the period when its service held up, and declined only when the service declined. The same is true for Akron. The growth in traffic in the Louisville-Moline market is real enough, but has been aided by an improvement in service; underlying demand has not grown as rapidly as the passenger figures suggest. This effect of improved service on traffic volume is shown dramatically in the case of Paducah, because of the dramatic service improvement. Adding the data on service reveals a very different picture from that apparently presented by the passenger data for the two years alone.

Pity, then, the poor analyst who has the traffic data for one year only and lacks information on the convenience of making a round trip. For example, such an analyst-in-the-dark, looking just at the passenger figures for 1950, would never have guessed that the Louisville-Paducah market was as large as the others. Similarly, the data for 1964 alone would not have revealed the past size of the Indianapolis and Akron markets nor suggested airline service as a reason for their decline.

My next example is a case history with unfortunate consequences that a greater understanding of the realities and semantics of air passenger transportation might have averted. Years of unnecessarily inconvenient travel might have been avoided and a giant wave of passenger growth might have smoothed into a gently rising tide.

The case in point is Denver-Atlanta. In late 1967 Denver petitioned the C.A.B. for first and second, competitive, nonstop Denver-Atlanta service. To call for such service in a city-pair market that had fewer than twelve passengers per day in each direction was, to say the least, unusual. There was at the time no nonstop service in the market, no nonstop authority, no usable single-carrier authority, no single-plane service. Therefore, the low true O&D passenger counts and perforce the on-line, coupon, and on board counts, represented the inconvenient service that existed, and had always existed, in the market. Denver called attention to this fact and noted the large and growing traffic potential.[5]

The Board, noting the small size of the market, turned Denver down. Denver filed again, and repeatedly called the Board's atten-

5. Motion for Expedited Hearing, Docket 19314, January 2, 1968.

tion to the growing demand, but without result for eight years.

When action was finally taken, and the service Denver had requested ten years before put in place, a torrent of 1,317 passengers per day was suddenly unloosed on the Denver terminal, most of whom stayed until they caught connecting flights. One always hopes for success in developing new markets, but as shown in the table below, this one was overpowering. I well remember the comment of Tedford Dees (the Denver attorney who had pursued this new service on behalf of the city for so many years) as the first planeloads of passengers to and from Atlanta flocked into the terminal. "It's a zoo," he said.

	Denver-Atlanta Passengers				
	Actual Reported				On Board Potential
Year	True O&D	On-line O&D	Coupon O&D	On Board	Submitted In 1968 By Denver***
1966	8,530	150	na	na	85,230
1970	22,430	6,510	3,730	na	149,070
FY74*	39,790	11,630	7,160	0	(not est'd)
FY79**	118,310	247,550	476,790	480,554	(not est'd)

* Year ended June 30, 1974.
** Year ended September 30, 1979.
*** Assuming service of the type finally provided in 1979.
na Not available.

The withdrawal of Norfolk-Baltimore service and the consequent true O&D traffic decline have already been noted in Chapter 4. As great as the decline in true O&D passengers was, the on board traffic fell even further. Between the last half of 1970 and the fourth quarter of 1975 (both at an annual rate), while true O&D fell from 41,260 to 1,880, on board traffic fell from 120,200 to just 248, a drop of 119,952 passengers.

The fact that some airline executives place their primary faith in such on board data to measure the "real size" of markets is enough to make one wonder: *how big are the markets that are being overlooked?*

PART TWO

THE SEMANTICS OF AIRPORT LOCATION

10

Do Airports Move?

Apart from aircraft carriers for use by the brave, and rivers and bays for use by pontoons, there are few moving airports. Many fewer, anyway, than one would suspect from the talk over the years about Chicago moving its airport, Dallas moving its airport, Detroit moving its airport, Houston moving its airport, Kansas City moving its airport, and so on.

Indeed, in most of these instances, the old airport is right there where it always was.

The talk about "moving an airport" is just another example of how our language conditions us to use spatial metaphors for non-spatial events, in this case a licensing. No airport has moved; there has only been a redesignation of the place at which the carrier is to land to discharge and take on passengers. To say that the airport moved deemphasizes the fact that it is the planes and the people that must now move to a new location on every flight and for every trip. The metaphor obscures the impact on people.

An airport's accessibility to potential passengers has a profound effect on the number of their trips, because it affects the convenience of every trip going and coming. For example, if a person makes twenty round trips a year, an extra ten miles and twenty minutes to the airport amounts to an additional 400 miles and more than thirteen hours, two business days, per year.

Moving airline services to a new airport, although it generally moves them farther away from most people, makes them more ac-

cessible for others. For example, when Chicago's air service was moved from Midway Airport to O'Hare Airport, traffic fell at Rockford's airport, even though Rockford was seventy-two miles to the west. Service at Chicago was so much better than at Rockford, and O'Hare so much closer than Midway, that Rockford passengers found it more convenient to make their round trips through O'Hare than through their own airport.

Far more potential travelers have a choice of airports than is generally realized. Akron passengers can use Cleveland; Fort Dodge passengers can use Des Moines; Muskegon passengers can use Grand Rapids; Trenton passengers can use Newark or Philadelphia; and Youngstown passengers can use Cleveland or Pittsburgh.[1] Each of these communities also has its own airport, but to equate the traffic there with the total traffic generated by the community is a mistake.

Because airport location affects the convenience of every prospective passenger on every trip, the choice of the airport to be served can have profound consequences. When North Central (now Republic) chose to serve Appleton through Oshkosh, the travel convenience of some Appleton, Neenah, and Menasha passengers was reduced to such a degree that they decided to form their own airline. The resulting carrier, Air Wisconsin, based at Appleton, now transports far more passengers to and from that station than North Central ever did.

Airports don't move, but the location of the airport at which air service is provided makes a continuing difference in how far people have to move themselves to get to it and, therefore, how often they will choose to do so.

1. See Appendix O for a longer but still incomplete list.

11

Do You Have To Go?

I am well aware that some people find it difficult to believe that moving air service to a more distant airport affects how many trips are made. As a market research analyst, I must concentrate on what people do, and not on what they say, because what they do and what they say they do are frequently very different.[1] However, airport location is so influenced by public opinion, and so important (because a decision on airport location affects every potential traveler) that this particular opinion must be investigated.

I have, therefore, studied people's attitudes about the effect of airport location on travel convenience and on the number of trips they would make. The following questions have been particularly revealing:

Q. 1. Would it affect the number of trips of 500 miles or more which would be made, if the local airport were 10 miles farther away from the prospective passengers? (Yes or No _____)

Q. 2. Why? _____

Most answers to Q. 1 are in the negative.[2] The basic reason given in answer to Q. 2 is that ten miles farther to the airport would not

1. For example, if "junk mail" is so disliked, why is there a thriving direct mail industry out there? Or again, if most people avoid crowds, how do they ever form in the first place?

2. For example, by 88.2% of the applicants for the position of economic analyst at my firm.

make a difference on a trip of 500 miles. This was expressed well by the Butte traveler who responded to a similar query in the survey there that "another half hour would not make any difference on a long trip." However, if pressed for further explanation, most respondents reveal that they are reasoning about a *single* trip. This is shown by such expressions as "Let's assume I have to make *a trip* . . . " and "When you have to make *a trip* of 500 miles or more, then . . . " and "There isn't any way I can make *a trip* of that length better than to fly."

Now, the original question asks whether an airport farther away would "affect the number of trips" which would be made (the word *number* is even underlined), but the answers are based on the assumption that *a given trip will* be made. This is an error in logic, because one cannot explore factors which would affect the *number* of trips which *would* be made by studying *one* trip that *must* be made.

This is another example of a focus on functional rationality to the exclusion of substantive rationality.[3] The question is transformed into "how do I do what must be done?" and the deeper question about how frequently it is worth doing, if at all, is never reached.

A particularly vivid example of the immediate intrusion of narrow functional rationality, followed by second thoughts of a slightly broader nature, is contained in the answer given by a manager of industrial engineering in the similar survey conducted in Green Bay.

> No. The trips must be made and other forms of transportation are not practical due to the length of the trips. However, the cost of the trips, in both time and money, would certainly be increased, and we would have a tendency to become more and more critical of the need to make a trip when a letter or phone call might possibly substitute.[4]

A still broader view, one that considered repetitive trips, would disclose even more ways to curtail the number of trips, including the invisible substitute, fewer trips of longer duration.[5]

When we think about all the trips, rather than just one trip, it is

3. See discussion in Chapter 4.

4. Brief of Brown County, Wisconsin, to Examiner Edward T. Stodola, North Central Area Airport Investigation, C.A.B. Docket 13743, November 8, 1963.

5. See discussion in Chapter 7.

obvious that airport distance must affect some of them. There is no magic point which is too far or just short of being too far. Out of any large number of trips there are always some that are marginal, so that any further cost – an increase in the fare, the threat of a rainstorm, a strike by airport porters, more distant parking, a less conveniently timed flight, difficult access for the handicapped, or a longer trip to the airport – will dissuade at least a few prospective passengers from making a trip at this time. Postponements, as well as outright cancellations, of course, reduce the number of trips in any given year.

Each additional mile and minute, and every other factor influencing the convenience of making a round trip, affect the number of trips that will be made.

There can be no realistic doubt that decreases in airport accessibility reduce passenger traffic; the effect has been proven too many times by too many different methods.[6] A demonstration that poorer airport accessibility increases passenger traffic, or has no effect upon it, would be contrary to experience and economic theory, and no such demonstration has yet been made.

One point frequently raised is that the depressing effect of poorer airport accessibility may apply only, or almost only, to short-haul traffic. The argument goes something like this: an increase of ten ground miles, for example, does not make as much difference on a long air trip as on a short one. There are more substitutes, especially automobile travel, for short air trips. Therefore, the decline in air traffic is confined, or mostly confined, to the shorter air trips.

Although I know of no *a priori* reason why this supposition should not be true, it turns out to be false. A study of Dallas traffic presented as far back as 1955[7] showed that both long-haul and short-haul air traffic are lost as traffic-generating centers become more distant from an airport. That study was based on passengers per thousand population, adjusted for income, in concentric rings around Dallas Love Field, a useful but complex demonstration.

A recent and less complex study confirms the earlier result from an entirely different angle. The new study is based on Kansas City's share of total U.S. passengers by air mileage bands at its old airport, two miles from town, and at its new airport, eighteen miles from town. The transition of air service from the old to the new airport

6. See Appendix P.
7. See Appendix P, item 3.

took place in 1972, so there has now been adequate time to analyze the effects. The analysis demonstrates that the airport change caused a ten percent reduction in total Kansas City traffic and, significantly, that the loss occurred in all mileage bands: 0-299 miles, eleven percent; 300-599 miles, seven percent; 600-999 miles, ten percent; and 1,000 miles and up, fifteen percent.[8]

Thus, changes in airport accessibility, by affecting the round-trip convenience of air trips of all distances, influence traffic in all mileage bands. This means that decreases in airport accessibility reduce round-trip convenience in much the same way as do changes in airline schedules. For example, adding a stop to the flight out and the flight back will cause a percentage reduction in traffic at the same rate, with one exception, regardless of whether the trip is a short or a long one. The same is true for other changes in scheduling that affect round-trip convenience.[9] The exception occurs only when the accumulated deterioration in schedules triggers an additional short-haul distance penalty,[10] after which traffic falls more rapidly in view of the more numerous substitutes for short-haul trips. Nothing discovered about the effects of airport location on traffic differs from this general model.

The important things to note, however, are that even though decreased airport accessibility depresses short-haul trips slightly more than average, trips are lost from all mileage brackets, and that because there are more passengers in the medium-haul and long-haul distance ranges, most of the traffic loss occurs on the medium-haul and long-haul air trips. In other words, no matter how far the projected trip, if the inconvenience of making it increases, there are always some passengers who will decide that they really do not have to go.

8. See Appendix Q. The interesting increase in loss of trips of longer distance is apparently related to the incremental effects of the longer ground trip on the number of *nights away* one must spend per trip, although the point has not been pursued.

9. See discussion in Chapter 8.

10. See Appendix M, item J.

12

How Many Miles Equal A Stop?

From the prospective air passenger's point of view airport accessibility and airline schedules are simply two parts of something bigger: what it takes to make a round trip by air. Changes in either factor affect passenger convenience. More distant airports and poorer airline schedules both decrease convenience and produce fewer air trips. Nearer airports and better airline schedules both increase convenience and generate more air trips.

Travelers are understandably disinclined to go to more distant airports to obtain poorer schedules. When the nearest airport also has the best schedules of any within a reasonable drive, which is frequently the case, there is no need to study more distant airports. Nothing of any particular interest will be going on in such situations.

However, when the nearest airport to the prospective passenger has poorer airline schedules in any given market than another one nearby, the two types of convenience may start to work against each other. Prospective passengers must then judge which combination of ground access and schedules suits them best. If enough passengers choose a more distant airport, traffic may then decline at the nearest airport to a point where service is no longer financially feasible.

The failure to develop service and traffic at the nearest airport under such circumstances has frequently prompted unfriendly debate between the local carrier and civic officials. The carrier claims, perhaps rightly, that the community has not generated the passengers needed to support its service. The civic leaders claim, perhaps also rightly, that the carrier has not provided schedules good enough

to develop the traffic. The carrier says it has adequately tested the market; the civic officials deny it. The carrier says that the local passengers prefer the more distant airport; the civic .officials call this nonsense, since obviously the passengers would prefer the shorter trip to their own airport. This chicken-and-egg priority argument has gone on in one place after another for years with great waste of substance and spirit.

The argument is now often further complicated by disputes about two other factors that work against each other: the number of flights and the size of aircraft. More flights are better than fewer flights. Large aircraft are better than smaller aircraft. However, the question is whether more flights with small aircraft are better than fewer flights with large aircraft. The answer then depends upon the following: (1) the specific aircraft, and the number and timing of the schedules being compared; (2) how much round-trip convenience each offers; (3) how many passengers will be generated by that degree of convenience; and (4) whether that number permits an economic airline operation. The mystery melts away once aircraft size and the number of schedules are seen as just two parts of the larger question of round-trip convenience.

A similar situation occurs where neither the nearest nor a more distant airport has a clear-cut advantage; the prospective passenger then has to decide which actual combination of ground access plus scheduling to use. The analyst, however, must determine: (1) how much round-trip convenience various possible schedules at each airport would offer, (2) how many passengers would be generated by those levels of convenience in competition with each other for the passengers' favor, and (3) what schedules, if any, would permit an economic operation at the subject (usually the nearer) airport.

What happens is this: if air service is improved at the local airport, its traffic increase will be larger than can be accounted for by normal service stimulation at an independent airport,[1] because there will also be a recapture of traffic from the competing airport. Conversely, if service deteriorates, the traffic decline will be greater than at an independent airport, because in addition to the normal service destimulation there will be traffic diversion to the competing airport.

Of course, what really matters is the change in service at the local

1. That is, of the type shown in Appendix J, an airport not competing with a nearby better-served one.

airport *relative to* service at the more distant airport. A decline in service at the more distant airport will have the same effect on airport choice as an improvement at the local airport. An improvement at the more distant airport will have the same effect as a service deterioration at the local airport.

In markets where both airports have the same quality of airline service, substantially all local passengers will use the local airport; there is nothing to be gained from a longer ground trip. As service at the local airport deteriorates, however, an increasing share of the local passengers will make the longer ground trip and use the more distant airport. These effects have been measured repeatedly in many different competitive airport situations and are highly predictable.[2]

Although citizens, being citizens, will frequently speak in favor of the local airport, their behavior demonstrates that they will go where the combination of ground accessibility and airline schedules is most convenient. Frequent travelers (and they produce the bulk of air trips) become very knowledgeable about the mix of airports and airline schedules. They will know, for example, that they can't leave from one airport and return to the other without creating a problem retrieving their cars. They will consider the uncertainties of their return trips and perhaps use the better-served more distant airport to obtain flexibility rather than relying on a single good schedule to the nearer airport. In other words, they make reasonable judgments about which combination of airports and schedules best suits their round-trip convenience. This ability can be traced right down to choice of airport by market by time of day.[3]

The amount of ground inconvenience that is equivalent to schedule inconvenience depends upon more factors than ground distance alone (for example, on the quality of roads, parking fees, and tolls). Nevertheless, the various studies performed indicate that each added mile to an airport reduces resident passenger traffic by about one to one-and-a-half percentage points, while the effect on non-resident traffic is less, apparently because non-residents do not have to fight the ground battle on each of their trips.

There is a considerable range around these averages; if an accurate result is needed, a study should be done for the community in question. Nevertheless, a rough rule of thumb is that every fifteen to

2. See Appendix R.
3. See Appendix R, pages 8 and 9.

twenty miles of added airport distance is equivalent to another aircraft en route stop. Thus, moving a community's air service to an airport about seventeen miles away would be like adding another stop to every scheduled flight at that community forever for every passenger who had to travel the extra seventeen ground miles.

The significance of airport location is, therefore, very great. A one-stop flight can be changed to a nonstop flight. However, once an airport is located, it is generally there to stay. It affects convenience permanently.

Anything that affects air passenger convenience affects the number of trips persons will make, and has further repercussions on their lives and their relations with other persons. The course of wisdom is to penetrate the semantic barriers, grasp these fundamental personal and social effects, and give them due weight in our decisions.

APPENDICES

PROOFS AND OTHER DETAILS

THE AUTHOR'S AIR TRAVEL IN 1980

1980 Date	Carrier, Flight, And Flight Itinerary	Number of Passengers Author Was: On Board	En-planed	On-line	True O&D	Round-trip
1/8	NW537 PHL-MKE-MSP	2	1	1	1	1
	NW69 MSP-BIL-BZN-BTM	3	1			
1/9	GQ32 BTM-BIL	1	1	1		
	NW62 BIL-FAR-MSP	2	1	1	1	
	RC526 MSP-EAU-CWA-GRB	3	1	1		
1/10	RC412 GRB-OSH-MKE-CVG-PHL	4	1			
1/14	EA127 PHL-ATL	1	1	1	1	1
	EA793 ATL-CAE	1	1			
	DL473 CAE-ATL	1	1	1	1	
	DL592 ATL-PHL	1	1			
1/23	UA723 PHL-ORD	1	1	1	1	1
	UA673 ORD-CID	1	1			
	UA834 CID-ORD	1	1	1	1	
	UA240 ORD-PHL	1	1			
2/14	UA91 PHL-CLE	1	1	1	1	1
	UA815 CLE-FWA	1	1			
	UA720 FWA-CLE	1	1	1	1	
	UA90 CLE-PHL	1	1			
2/21	EA579 PHL-CLT	1	1	1	1	1
	EA375 CLT-CAE	1	1			
	EA608 CAE-CLT-PHL	2	1	1	1	
3/26	AL900 PHL-DCA	1	1	1	1	1
	AL904 DCA-PHL	1	1	1	1	
4/1	AL111 PHL-ORF	1	1	1	1	1
	AL278 ORF-PHL	1	1	1	1	
4/16	OZ541 PHL-IND-DSM	2	1	1	1	1
4/17	OZ949 DSM-STL	1	1	1	1	
	TW422 STL-PHL	1	1	1		
5/28	UA155 PHL-ORD	1	1	1	1	1
	UA811 ORD-DSM	1	1			
5/29	UA948 DSM-ORD	1	1	1	1	
	UA144 ORD-PHL	1	1			
7/15	AL293 PHL-PIT	1	1	1	1	1
	AL167 PIT-STL	1	1			
	TW500 STL-PHL	1	1	1	1	
7/20	UA115 PHL-ORD	1	1	1	1	1
	RC937 ORD-GRB	1	1	1		
7/21	RC344 GRB-GRR-DTW	2	1	1	1	1
	NW54 DTW-PHL	1	1	1		
8/21	AL907 PHL-DCA	1	1	1	1	1
	AL980 DCA-PHL	1	1	1	1	

1980 Date	Carrier, Flight, And Flight Itinerary	Number Of Passengers Author Was: On Board	En-planed	On-line	True O&D	Round-trip
9/2	TW431 PHL-ORD	1	1	1	1	1
	ZW189 ORD-ATW	1	1	1		
9/3	Pvt ATW-MSP	na	na	na	1	
	NW50 MSP-PHL	1	1	1		
9/15	NW51 PHL-DTW-MSP-GEG	3	1	1	1	1
9/16	NW50 GEG-BIL-MSP/MSP-PHL	3	2	1	1	
10/9	AL911 PHL-DCA	1	1	1	1	1
10/10	AL975 DCA-PHL	1	1	1	1	
10/15	AL902 PHL-DCA	1	1	1	1	1
	AL912 DCA-PHL	1	1	1	1	
11/13	NW55 PHL-DTW-MSP	2	1	1	1	1
	NW54 MSP-DTW-PHL	2	1	1	1	
11/23	AL996 PHL-DCA	1	1	1	1	1
11/24	AL912 DCA-PHL	1	1	1	1	
Total passengers		72	55	42	36	18

Total persons: 1
Total carriers: 10 (AL, DL, EA, GQ, NW, OZ, RC, TW, UA, ZW)
Total terminal entries: 94 (underlined above)

Codes:
AL - USAir
DL - Delta
EA - Eastern
GQ - Big Sky
NW - Northwest
OZ - Ozark
RC - Republic
TW - Trans World
UA - United
ZW - Air Wisconsin
Pvt- privately owned plane

ATL - Atlanta
ATW - Appleton
BIL - Billings
BTM - Butte
BZN - Bozeman
CAE - Columbia, S.C.
CID - Cedar Rapids
CLE - Cleveland
CLT - Charlotte
CVG - Cincinnati
CWA - Central Wisc.
DCA - Washington Nat'l
DSM - Des Moines
DTW - Detroit
EAU - Eau Claire
FAR - Fargo
FWA - Fort Wayne
GEG - Spokane
GRB - Green Bay
GRR - Grand Rapids
IND - Indianapolis
MKE - Milwaukee
MSP - Minneapolis
ORD - Chicago O'Hare
ORF - Norfolk, Va.
OSH - Oshkosh
PHL - Philadelphia
PIT - Pittsburgh
STL - St. Louis

MSP/MSP on 9/16 shows an unscheduled en route aircraft change.

Source: Author's travel records.

DENVER "PASSENGERS"

Item (1)	Type Of Denver Passenger Traffic (2)	1979 Passengers (3)
1	Total passengers transported	20,779,635
2	Through passengers	3,053,775
3	Coupon origin-destination passengers	17,725,860
4	On-line connecting at Denver	4,556,870
5	On-line Denver origin-destination	13,168,990
6	Interline connecting at Denver	3,942,490
7	Denver true O&D passengers	9,226,500
8	Denver true O&D interline connecting	797,590
9	Denver true O&D on-line local	8,428,910
10	Denver true O&D on-line connecting	879,680
11	Denver true O&D single-plane passengers	7,549,230
12	Denver true O&D single-plane with stops	1,259,230
13	Denver nonstop true O&D passengers	6,290,000

Source: Item 1 - C.A.B. service segment data (ER-586).
2 - Item 1 minus Item 3.
3 - C.A.B. Airline Traffic Survey, Table 13.
4 - Item 3 minus Item 5.
5&9 - C.A.B. Airline Traffic Survey, Table 10.
6 - Item 5 minus Item 7.
7 - C.A.B. Airline Traffic Survey, Table 8.
8 - Item 7 minus Item 9.
10 - C.A.B. Airline Traffic Survey, Table 12 (for year ended 9/30/79 adjusted to calendar 1979 in line with Item 9).
11 - Item 9 minus Item 10.
12 - Estimated from Item 11 and 6/79 schedules for each Denver city-pair.
13 - Item 11 minus Item 12.

PASSENGERS CONFUSED WITH PERSONS

"A person is a passenger of the carrier when he enters the premises, intending to use the carrier's services." Martin J. Ross. *Handbook of Everyday Law*, 3d rev. ed. New York: Harper & Row, 1975.

"PASSENGER, REVENUE: A person receiving air transportation from the air carrier for which remuneration is received by the air carrier. Air carrier employees or others receiving air transportation against whom token charges are levied are considered nonrevenue passengers. Infants for whom a token fare is charged are not counted as passengers." *Glossary of Air Transportation Terms*. Civil Aeronautics Board. 1977.

"In this study they predict that by 1985, we will be serving 120 million people a year and that by the year 2000 we will be serving 300 million passengers a year." Clifton A. Moore, General Manager, Los Angeles Department of Airports. "Solutions to Airport Capacity Problems," speech to Airport Operators Council International 25th Annual Conference, Denver, September 8, 1972.

"Statistics show that more than 1 billion persons have traveled internationally in the past five years, but Seawell warned that there must not be a let-up in developing improved technology." *Aviation Daily*, September 15, 1977, describing remarks of Chairman William Seawell of Pan American.

"According to data published by the Civil Aeronautics Board, during the year 1975, 1,213,490 passengers were flown to and from Norfolk. That's a lot of people, and it ranked Norfolk as the 45th largest air market in America, according to numbers of passengers." Donald F. McGuire, Director - State & Community Affairs, National Airlines. Speech to Norfolk Rotary Club, May 3, 1977.

Source: As noted.

QSI

This study was undertaken in 1969-70 in order to improve upon the factors[1]/ previously used in route cases to forecast total market traffic changes associated with changes in service quality. Period covered: two nine-month periods substantially free of strikes [with] fares relatively stable. Type of markets examined: The Study included 141 of the largest one-carrier and 151 of the largest two-carrier markets in terms of local and interline connecting single-carrier (Table 10) traffic. The single-carrier [on-line] traffic correlated somewhat better with the service quality factors than [did] the [true] O&D traffic.

Quality of service weighting factors

Factor	QSI Weight	For
Frequency	1.00	each one-way flight for each day of the week scheduled
Equipment:[2]/		
Jet	1.85*	B-747*
	1.50*	DC-10*, L-1011*
	1.30	DC-8-61 (D8S)
	1.00	B-707, B-720, B-727, B-737, CV-990, CV-880, DC-8 (except-61), DC-9-30
	.78	BAC-1-11, DC-9-10, SE-210
Turboprop	.75	Electra
	.45	VV-700/800, CV-580, YS-11
	.43	CV-600, F-27, FH-227
	.20	N-262
	.17*	DHC-6*
	.13*	B-99*
Piston	.65	Constellation, DC-7, DC-6
	.40	CV-240/340/440, M-404, DC-3
Stops	1.00	nonstop
	.55	one-stop
	.40	two-stop
	.03	three-or-more stop

1/ Schedule frequency, number of intermediate stops, and type of equipment.
2/ Equipment types marked "*" did not appear in the data covered by the study; their QSI weights are estimated.

Source: Exhibit BOR-2 filed by the C.A.B. Bureau of Operating Rights in C.A.B. Docket 22908.

COMMENTS ON QSI

1. "At best, the QSI can only be a partial guide to traffic analysis. To use the QSI as the sole and ultimate arbiter is to turn a blind eye on the many significant factors which it does not incorporate. Some of these shortcomings of the QSI are:

   - It pays no heed to the time of day that flights operate; there is no distinction between prime and non-prime times.

   - It ignores the timing of flights in relation to other flights. Parallel or identical departures are rated the same as well spaced departures.

   - It pays no heed to the directional flow of the services provided a market."

2. "The Buffalo Parties are truly astounded that the Bureau of Operating Rights [relying on QSI] could argue that the services proposed by Allegheny do not offer 'the traveling public any meaningful benefits' (BOR Brief, p. 2), and again that they 'offer no significant public benefits in either the local or beyond markets.' (p. 3). . . . The current (February, 1975) schedules in the Buffalo-Philadelphia market are as follows:

Actual Flights in February, 1975

Buffalo To Philadelphia			Philadelphia To Buffalo		
Leave	Arrive	Flight	Leave	Arrive	Flight
1040a	1135a	EA941	725p	825p	UA791
530p	631p	UA858	950p	1047p	EA914

"These schedules, the ones currently offered, do not permit an early morning arrival in either direction, and, indeed, permit no daytime arrival in Buffalo at all. . . . The way to see the benefits is to look at the schedules.

Allegheny's Flights Proposed In Exhibit AL-313
Combined With Actual February, 1975, Flights

Buffalo To Philadelphia			Philadelphia To Buffalo		
Leave	Arrive	Flight	Leave	Arrive	Flight
720a	903a	AL-A	918a	1107a	AL-B
1040a	1135a	EA941	725p	825p	UA791
530p	631p	UA858	950a	1047p	EA914"

Source: See page 2 of this appendix.

3. "However, the fact that traffic and capacity sometimes both decline [as shown by QSI] presents a chicken-and-egg dilemma. It certainly does not prove that traffic decreases as a result of frequency reduction; it could as easily prove that the carriers reduce frequencies in an effort to accommodate capacity to slow traffic growth. . . ."

4. "'Quality of Service' generally refers to the frequency, type of equipment, and number of intermediate stops used in providing air transportation service to a city-pair market."

5. "Using a technique somewhat different from those of the Bureau and Delta, the City of Kansas City estimates that after stimulation there will be 81,100 O&D and connecting passengers in the Kansas City-Miami market in 1972. This figure compares with Delta's forecast of 82,862 passengers and that of the Bureau of 71,813 passengers. Kansas City's estimate takes into consideration the fact that the best present schedules (one-stop) are bunched together, whereas Delta has proposed a rounded pattern of schedules with well-spaced morning, afternoon, and evening departures. Delta's pattern of service will be more attractive to Kansas City passengers than the services they have been receiving, but the Bureau does not give this factor sufficient weight . . . . the traffic estimates of Kansas City and Delta are similar in this market and appear more likely to be achieved than that of the Bureau."

6. "[W]ithout the use of logically and empirically developed traffic forecasting techniques such as the QSI, it would be difficult, if not impossible, to postulate legally sound findings regarding the anticipated economic results in a proceeding. While the QSI methodology may be imperfect, it is a 'window on the future,' and there is no reason to believe that the application of this technique will produce unreasonable or otherwise untenable results."

7. "It has been demonstrated in the past that passengers apparently place heavier emphasis on frequency levels, than they do on wide-bodied equipment. . . . TWA's schedule was specifically designed to meet this passenger demand. . . . [T]he Board should not accept for case purposes, slavish adherence to QSI results."

8. "Allegheny claims that the timing of its flights is the critical factor, and it correctly observes that the QSI point system completely ignores this factor."

Source: Item 1 - Western's Exhibit WA-SR-1 in C.A.B. Docket 32376.
2 - Reply Brief of the Niagara Frontier Transportation Authority in C.A.B. Docket 20472.
3 - Order 71-4-54 in C.A.B. Docket 21866-6B.
4 - Final Environmental Impact Statement, Metropolitan Washington Airports Policy, F.A.A., August, 1980.
5 - Initial Decision of Examiner Thomas P. Sheehan in C.A.B. Docket 18610.
6 - Initial Decision of Administrative Law Judge Alexander N. Argerakis in C.A.B. Docket 25881.
7 - Brief of Trans World Airlines in C.A.B. Docket 27932.
8 - Initial Decision of Administrative Law Judge Burton S. Kolko in C.A.B. Docket 20472.

REASONS FOR TRAVELING

The following paragraphs are summaries of testimony of Norfolk-Baltimore air travelers filed on October 28, 1975, in the Baltimore-Norfolk Service Case, C.A.B. Docket 27506.

T-1: International Harvester dealer with regional office, parts depot, dealer counsel meetings, training schools, and stock of trucks all in Baltimore. Star dealer trips leave from Baltimore.

T-2: Curtis Bay Towing Company with home office in Baltimore. Travel there for consultations and meetings. Ship heavy parts from there to Norfolk. Cousin in Baltimore.

T-3: Firm of architects and engineers with business interests, including one very good client, in Baltimore.

T-4: Iron and metal company does a lot of business with metal dealers and shipyards in Baltimore. Wife's family lives in Baltimore.

T-5: Steamship agents and coal forwarding agents with clients and potential clients in Baltimore, also travel there to conduct business with railroad officials and to see sub-agents.

T-6 and T-26: Bank has business and customers in Baltimore and also needs Baltimore service for connections elsewhere.

T-7: Ships agents, stevedores, and terminal operators with home office in Baltimore.

T-8: Housewife with family in Baltimore and daughter in college there, also needs to travel there twice a month to handle an estate.

T-9: Wholesaler of military uniforms and accessories travels to Baltimore to contact suppliers and customers. Wife is from Baltimore and they go there to visit.

T-10: Stock brokerage firm under the supervision of regional office in Baltimore. Analysts visit Baltimore, and operational employees and analysts from Baltimore visit Norfolk. Have also needed to get to Baltimore to make connections on Bermuda trips. Company seminars are held in Baltimore.

T-11 and T-25: Virginia Port Authority meets with the Maryland Department of Transportation, the Maryland Port Authority, and various federal and state officials in Baltimore. Attorneys travel to Baltimore to appear at rate hearings, before various maritime committees, and to solicit business. Consultant comes to Norfolk for meeting once a month.

T-12: Norfolk Shipbuilding and Drydock Corporation estimators need to get to ships while they are in port briefly in Baltimore to avoid daily demurrage of $5,000 in some cases.

T-13: Manufacturer of veneers and lumber with world-wide import and exports needs Baltimore service for connections to central Pennsylvania and international points.

T-14: Montgomery Ward district office, with four stores in the Norfolk area and eastern regional headquarters in Baltimore. District manager, nine constituents and four merchandisers travel to Baltimore, and 30 of 51 departments have meetings there twice yearly.

T-15: Ship's chandlers meet ships in Baltimore with supplies, usually on very short notice.

T-16: Fuel oil distributor with oil heating association meetings and three major suppliers in Baltimore.

T-18: Dredging company with regular jobs in Baltimore.

T-19: Physician travels to Baltimore once a month to visit mother-in-law, who would also like to visit them in Norfolk.

T-20: Manufacturer of railroad track maintenance machinery makes sales and service calls on railroads in Baltimore. Also needs service to Baltimore to make connections elsewhere.

T-21: Firm of admiralty attorneys represents maritime insurance companies and must reach ships while they are in port in Baltimore. Have needed Baltimore service for connections for Bermuda, Acapulco, Jamaica, west coast, and Texas.

T-22: Chesapeake and Potomac Telephone Company with related cable-manufacturing plant and sizable engineering organization in Baltimore.

T-23: Surgeon visits several Baltimore hospitals in professional capacity, also must attend a number of academic functions at Johns Hopkins. Wishes to attend boat shows in Baltimore. Would also like to make international connections at Baltimore.

T-24: Cement company travels to Baltimore to off-load barges.

T-27: Firm, specializing in putting together sports and trade shows, with clients, including largest account, in Baltimore area. Made twice-weekly trips for some time and brings in groups of eight or nine people at a time for shows.

T-28: General hospital needs service to Baltimore to connect with flights to west coast and Bermuda. Administrators have evening meetings in Baltimore and dietary consulting firms come to Norfolk.

T-29: Carpet wholesaler in Norfolk area with business partner in Baltimore who operates three stores in the Baltimore-Washington area. Each needs to visit the other.

T-30: Sand, gravel, and concrete company. Travel to Baltimore to conduct business with parent company. President also visits daughter in school there. Parent firm

sends executive vice president, real estate, and computer personnel to Norfolk periodically.

T-31: Firm of architectural engineering consultants with clients in Baltimore.

T-32: United States Coast Guard with major shipbuilding and overhauling facility in Baltimore, and related engineering offices in Norfolk.

T-33: Commercial real estate broker with clients and prospective clients in Baltimore, also travels there to inspect properties and observe activity of competitors.

T-34: Steamship agents send ships' pilots, port captains, and crew members to meet ships in Baltimore. Travel to company's Baltimore office for management consulting meetings. Also, prospective clients come to Norfolk.

T-35: Sports editor of The Virginian-Pilot travels to Baltimore to cover Baltimore Colts, Baltimore Orioles, and Norfolk-Baltimore hockey games.

T-36: Law firm with good deal of maritime law work travels to Baltimore in conjunction with cases they are handling. Need Baltimore service for connections to Bermuda.

T-37: Manufacturer and distributor of pharmaceuticals and hospital supplies with branch office in Baltimore, and several large contracts with the State of Maryland. Need to get to Baltimore for connections to San Juan on regular pharmaceutical purchasing trips.

T-38: General contractors specializing in waterfront work with home office in Baltimore. Father lives in Baltimore.

T-39 and T-40: Fertilizer manufacturer employs engineering contracting firms in Baltimore, also travels there to meet with equipment and materials suppliers. Also need to travel to company's plant in Lancaster, Pennsylvania.

T-41: Advertising manager visits daughter, a patient in a Baltimore hospital. Periodically, she comes to Norfolk on leave from the hospital.

T-42: Company dealing in awards and gifts with some business in Baltimore. Also needs Baltimore service for connections elsewhere. Salesmen from Baltimore call on them in Norfolk.

T-43: Virginia's largest imported car dealership with distributor, port of entry, and mechanics' training sessions in Baltimore. Distributors come to the Norfolk area three or four times monthly.

T-44: Firm of certified public accountants with clients in Baltimore, also makes connections there for trips elsewhere. Son and daughter-in-law live in Baltimore.

Source: Exhibit ORF-5 in case identified at head of appendix.

SUBSTANTIVE CHANGES IN
NORFOLK-BALTIMORE TRIPS

	Norfolk-Baltimore					
	True O&D Passengers			Single-Plane Flights 1/		
		Daily Rate				
Period	Annual Rate	One-Way	Round Trips	Non-Stop	One-Stop	Total
	(2)	(3)	(4)	(5)	(6)	(7)
CY 1964	17,410	48	24	3	4	7
65	17,790	49	24	1	6	7
66	23,500	64	32	3	8	11
67	34,620	95	47	6	8	14
68	33,900	93	46	5	7	12
1969	41,210	113	56	6	7	13
70	40,100	110	55	8	6	14
71	37,580	103	51	6	4	10
72	30,210	83	41	3	2	5
73	23,940	66	33	2	1	3
1974	11,400	31	16	1	1	2
75	6,180	17	8	-	-	-
4th Q 75	1,880	5	3	-	-	-
FY 1976	3,400	9	5	-	-	-
FY 1977	34,220	94	47	8	-	8
3rd Q 77	47,240	129	65	10	-	10

1/ May service to Norfolk plus November from Norfolk, 1964-75, FY76 and FY77; November both ways for 4th quarter 1975; and August both ways for 3rd quarter 1977.

Note: Allegheny inaugurated service as a new Norfolk-Baltimore carrier in November, 1976.

CY - calender year; Q - quarter; FY - year ended Sept. 30.

Source: Col. (1) - Period.
(2) - C.A.B. Airline Traffic Survey, Table 8.
(3) - Col. (2) divided by 365, to nearest passenger.
(4) - Col. (2) divided by 730, to nearest round trip.
(5)&(6) - Official Airline Guide.
(7) - Sum of Cols. (5) and (6).

- There Is No Evidence That The 40,000 Or So Norfolk-Baltimore Passengers "Lost" In 1975 Rerouted Themselves Via Washington In Any Substantial Quantity

	Norfolk-Washington Passengers			
	True		Total	
Year	O&D	Conex**	Number	Per Day
(1)	(2)	(3)	(4)	(5)
1964	90,360	68,600	158,960	436
65	112,310	88,360	200,670	550
66	118,200	97,980	216,180	592
67	134,750	101,470	236,220	647
68	123,470	93,780	217,250	595
1969	123,800	95,620	219,420	601
70	106,830	86,850	193,680	531
71	91,610	84,410	176,020	482
72	101,590	82,790	184,380	505
73	100,700	84,230	184,930	507
1974	113,170	83,660	196,830	539
75	100,640	86,600	187,240	513
76	107,450	90,050	197,500	541
77	111,180*	86,520*	197,700*	542*

* Year ended September 30, 1977.
** On-line O&D making an interline connection at Washington (primarily) or Norfolk (a few) or both (very few). This is a frequently used concept in the airline industry.

Source: Col. (1) - Year.
(2) - C.A.B. Airline Traffic Survey, Table 8.
(3) - C.A.B. Airline Traffic Survey, Table 10.
(4) - Sum of Cols. (2) and (3).
(5) - Col. (4) divided by 365.

-Trips Postponed Or Avoided (Survey taken September 5, 1975)

"Since your last trip to Baltimore, have you had any occasion to postpone or avoid a Baltimore trip that you might have made if better service were available?" (1)	Number Of One-Way Journeys For Each Type Of Response (2)	Estimated One-Way Journeys Avoided	
		Factor (3)	Total (4)
Yes, definitely	120	1.00	120
Yes, probably	52	.67	35
No, probably	45	.33	15
No, definitely	123	.00	0
Subtotal	340	-	170
Not answering	9		
Total	349		

-Trips Lost

1. The table above shows 170 one-way journeys postponed or avoided since the respondent's last trip.

2. Considering that the question was asked at random, on average half the time from the last trip to the next trip would have expired when the question was answered.

3. Therefore, the total trips lost between the last trip and the next trip would be double that reported, or 340 one-way journeys.

4. It happens, by coincidence, that the respondents report 340 one-way journeys on their last trip.

5. Therefore, the number of trips (or one-way journeys) lost is 340 per 340 taken, or one for one.

6. Put another way, the total number of trips would double, if better service were available. Or, put still another way, half of the trips are now being lost for want of better service.

Source: Balance of this appendix.

-Mode Of Travel On Trips Not Postponed Or Avoided

How Last Trip Between Norfolk And Baltimore Out And Back Was Made (1)	Number Of Round Trips (2)	Number Of One-Way (3)	Number Of Total One-Way Journeys (4)	% Of One-Way Journeys (5)
Drove Entire Way:				
Via Washington*	58.5	1	118	33.81%
Via Eastern Shore	11.5	-	23	6.59
Not Available	10	2	22	6.30
Subtotal	80	3	163	46.70%
Flew, Connecting at Washington to:				
Another Flight	10.5	4	25	7.16
Rented Car	18.5	1	38	10.89
Being Driven	7.5	-	15	4.30
Other	.5	2	3	.86
Not Available	1	-	2	.57
Subtotal	38	7	83	23.78%
Flew National's Through Service	3	4	10	2.87
Flew AirExec**	27	9	63	18.05
Company or Other Private Plane:	7	-	14	4.01
Bus	3	-	6	1.72
Other Air	-	5	5	1.43
Other Ground	2	-	4	1.15
Other Mixed	-	1	1	.29
Grand Total	160	29	349	100.00%
(Respondents	160	17)		

* Includes trips via Annapolis.
** A commuter carrier.

Source: See pages 5 and 6 of this appendix, Question 2. Note that Col. (2) includes trips completed in both directions within the modes or subtotal groups whereas Col. (3) includes all other reported trips (either only one-way, or split between modes).

-Details Of The Resurvey.

Conducted by:	Norfolk Port and Industrial Authority
Mailed to:	The 244 respondents to earlier air travel surveys who expressed use of and/or need for Norfolk-Baltimore air service.
Mailing Date:	September 5, 1975.
Follow-Up:	Mailing September 17, 1975, to the 131 addressees who had not yet responded, and telephone calls from October 1 through October 6, 1975, to 21 who still had not replied, selected on a probability sampling basis.
Replies Received:	Nine returned undelivered, reducing base from 244 to 235. Usable replies equalled 177, or 75.4% of the 235. (Another 17 were returned blank or otherwise not usable.)
Mailing Material:	See below.

EDWARD MACNEAL ASSOCIATES
175 STRAFFORD AVENUE
WAYNE, PA. 19087
(215) 687-0442

September 5, 1975

We are economic consultants to the Norfolk Port and Industrial Authority, and are writing to you on an assignment for the Authority. Within the past year you indicated on a Norfolk Area Travel Survey that you used or needed service with Baltimore. As a continuation of that survey,

we now need your help to provide information on your most recent round trip between Norfolk and Baltimore, whether by ground or air travel. Please help by answering the three questions below.

1. When was your most recent round trip between Norfolk and Baltimore (no matter whether by air or ground, just the most recent one)?

_____ _____, 197__
Month Date

(Please estimate the date, if unsure.)

2. How did you make the trip? *(Check appropriate box or boxes.)*

☐ I drove the entire way by private car,
  ☐ driving via Washington.
  ☐ driving via the Eastern Shore.

☐ I flew between Norfolk and Washington, and between Washington and Baltimore I
  ☐ connected to another flight.
  ☐ rented a car.
  ☐ was driven in a private car.
  ☐ took a bus.

☐ I flew up on National's one-stop through flight around 5 PM.

☐ I flew down on National's nonstop flight around 11 PM.

☐ I flew up and back on AirExec's scheduled, light-plane, commuter service.

☐ I rented (or chartered) a plane.

☐ I took a bus for the entire trip.

☐ Other (please specify): _____

_____

_____

3. Since your last trip to Baltimore, have you had any occasion to postpone or avoid a Baltimore trip that you might have made if better service were available?

☐ Yes, definitely.
☐ Yes, probably.
☐ No, probably.
☐ No, definitely.

(Please return the survey promptly in the postpaid reply envelope enclosed.)

VALUE OF PASSENGER TIME

Item (1)	Description of Source (2)	Other Values, If Any (3)	For Year (4)	Final Value Per Hour (5)
1	New York's Domestic Air Passenger Market The Port Of New York Authority, 1965:			
	Median Income of air travelers	$11,400	1956	$ 5.94
	[at 1,920 hours per work year]	15,000	1963	7.81
2	De Vany, Arthur. The Revealed Value of Time In Air Travel. The Review of Economics and Statistics, Feb. 1974	$14,560	1968	$ 7.28
			1969	8.09
3	Air Travel surveys conducted through Chambers of Commerce, primarily of business travel; mean value:			
	Trenton, N.J.	$ 13.34	1966	$ 9.34
	Louisville, Ky.	13.41	1966	9.38
	Kansas City, Mo.	13.05	1968	9.14
	Butte, Mont.	14.93	1971	10.45
	Grand Rapids, Mich.	18.14	1971	12.70
	Dayton, O.	19.01	1974	13.31
	Norfolk, Va.	21.64	1974	15.15
	Toledo, O.	22.81	1974	15.97
	Youngstown, O.	19.07	1975	13.35
	Philadelphia, Pa.	21.18	1975	14.83
	Kansas City, Mo.	21.25	1975	14.88
	Grand Rapids, Mich.	22.44	1975	15.71
	Buffalo, N.Y.	22.62	1975	15.83
	South Bend, Ind.	21.87	1977	15.31
	Norfolk, Va.	27.35	1978	19.15
	Marshalltown, Ia.	20.67	1979	14.47
4	F.A.A. Draft Environmental Impact State-ment, Metropolitan Washington Airports Policy, March, 1978		1978	$12.50
5	C.A.B. Notice Of Proposed Rulemaking	$ 15.00		
	Docket 37982; PSDR-66, April 3, 1980	25.00	1980	$20.00

Source: As shown. Item 3 final value at 70% of mean reported value to allow for additional non-business travel.

TESTIMONY ON EXTRA NIGHTS AWAY
BY NORFOLK TRAVELERS TO BALTIMORE

The following questions and answers are taken verbatim from testimony of Norfolk-Baltimore air travelers filed on October 28, 1975, in the Baltimore-Norfolk Service Case, C.A.B. Docket 27506. (See Appendix F for additional data identifying the reasons each had for traveling.)

T-1: Q. Have you or your employees ever had to spend an extra night in Baltimore because of the air service?

A. Yes, that is the situation most of the time.

Q. What does that cost?

A. I would estimate it at about $30 in time, $20 for the hotel, and $6 for additional expenses per man.

T-3: Q. Have you ever had to spend an extra night in Baltimore because of the air service?

A. Yes, I do that two or three times each year.

Q. What does that cost?

A. About $400.00 in the cost of my time and in other expenses, and it upsets my schedule for the next day.

T-7: Q. Have you ever had to spend an extra night in Baltimore because of the lack of good air service?

A. Yes, I usually do.

Q. What does that cost?

A. It costs about $35 for the hotel, about $20 in expenses, and about $400 for the ten business hours lost on each round trip. I try to minimize the effect of my being away from my desk by carrying a page-boy pocket radio, but the effective radius is only about 35 miles, so I am necessarily out of touch during most of the drive to and from Baltimore.

Q. Has the lack of air service ever caused you other business problems?

A. Yes. For example, I should have been in Baltimore last Tuesday morning, but I couldn't get away the night before. Therefore, I didn't go, and missed a directors meeting as a result.

T-9: Q. Have you ever had to spend an extra night in Baltimore because of the air service?

A. Yes, two or three times in the last year, and it just kills the next day.

Q. How much does that cost?

A. My expenses are at least $25.00, and then if you include the cost of the time I lose the next day, the total would be over $200.00.

T-14: Q. Have you or your employees ever had to spend an extra night in Baltimore because of the air service?

A. Yes, most of the time it is necessary to go up at night for meetings which begin the following morning.

Q. What does that cost?

A. I would estimate the cost at about $25.00 for hotel and additional expenses. For most of our people there is also the intangible cost of having to be away from home and family overnight. For our business, there is the additional expense of losing productive time of valuable people.

T-16: Q. Have you or your employees ever had to spend an extra night in Baltimore because of the air service?

A. Yes, every time we go. At the present time it takes us close to three days to do what we should be able to complete in one day, and costs us approximately $100 in addition to the value of our own time.

T-21: Q. How would you benefit from better air service to Baltimore?

A. The main thing would be the saving in time. That would be a saving to our clients, rather than just to us, because we must charge the full actual travel time when we travel on business.

Q. What would you say the average charge is?

A. The going rate for admiralty is about $60 per hour.

Q. Do you ever have to spend an extra night in Baltimore because of the lack of good air-service?

A. Yes. That is about the only way in which the trip can be handled.

Q. What does that cost?

A. I would estimate it at about $35 for the hotel and $20 for other expenses.

T-23: Q. Have you ever had to spend an extra night in Baltimore because of the air service?

A. Yes, I stay over and drive back the next morning or drive to Washington and fly back from there.

Q. What does that cost?

A. I would say approximately $50.00 for a hotel room and other expenses, and nearly $1,000.00 for my time. If I know I will be in Baltimore on a particular day, I can't book surgery for the following day, because I know I will be in poor shape for it after the long trip back. Usually, I lose most of a whole day's work after a trip to Baltimore.

T-25: Q. How would your company benefit from better air service to Baltimore?

A. We could fly up, transact our business, and fly back, all in the same day, if the service were any good. The present service ties a man up for two days when one would do. Even if he only has one hour of business, he has to stay an extra night in Baltimore.

Q. How much does it cost to spend an extra night in Baltimore?

A. Approximately $50.00 for a hotel room and other expenses, plus the value of all the time that is wasted. For the top-level people it is a very expensive way for them to spend their time.

T-32: Q. How do your personnel go to Baltimore at present?

A. We always fly via Washington. At present we always have to go up the day before in order to attend meetings which begin around 9:00 a.m. This additional time cuts into our efficiency of operations.

Q. Do your personnel invariably require an extra night in Baltimore because of the air service?

A. Yes, every time.

In addition to time lost, this represents a minimum additional expense of $25.00 per person for a hotel room and related expenses.

T-35: Q. Have you ever had to spend an extra night in Baltimore because of the service?

A. Yes, two or three times in the last year. If I were sane, I would spend the night every time, but we are on a tight budget so I usually drive back the same day.

(continued)

T-9: Q. Have you ever had to spend an extra night in Baltimore because of the air service?

A. Yes, two or three times in the last year, and it just kills the next day.

Q. How much does that cost?

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Q. What does that cost?

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T-35: Q. Have you ever had to spend an extra night in Baltimore because of the service?

A. Yes, two or three times in the last year. If I were sane, I would spend the night every time, but we are on a tight budget so I usually drive back the same day.

(continued)

BEFORE-AND-AFTER ANALYSIS OF THE EFFECT OF CHANGE IN THE QUALITY OF AIR SERVICE* AND NATURAL GROWTH ON PASSENGER VOLUME AT CEDAR RAPIDS

The service stimulation effect of each one-step improvement in service class has been taken to be 16% in this study. The service stimulation factor was derived as follows:

1. The 1967 service of each of the 59 Cedar Rapids markets was scored using the methods described in Appendix M.

2. The 1967 scores of all 59 markets were then compared to the 1974 scores. Cities with similar changes in service were grouped and the median passenger change calculated for each such group.

3. A statistical regression was performed on the grouped data to correlate the percentage of passenger change to the change in service class. The result was approximately a 16% passenger change per one-step service level change as reflected in the equation below:

$$\text{Log (Percentage Passenger Change)} = 2.21233 + .06578 \text{ (Service Class Change)}$$

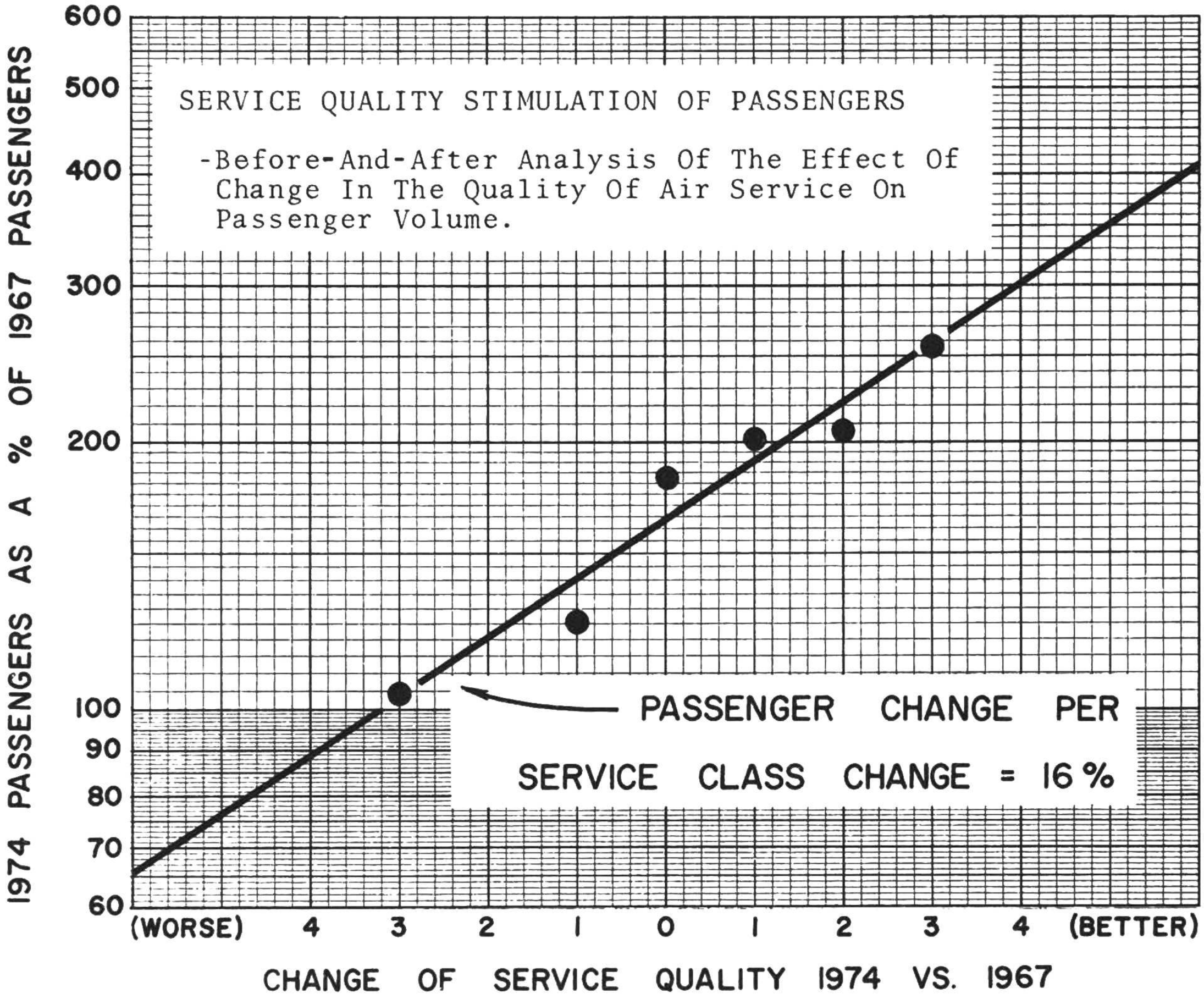
Coefficient of Correlation: $r = .97128$

Pages 3-5 present more details on the before and after analysis.

[* on the MacNeal Air Service Scale]

Source: Pages 2-5 - Scheduled Air Service Requirements at Cedar Rapids, Iowa, March, 1976.
6-12- Similar studies for seven other stations.

[midwest small hub]



Service Steps Better (Worse)	1974 Passengers as a % of 1967 (Median)
(3)	104%
(1)	126
0	183
1	201
2	207
3	255

Source: See page 2 of this appendix.

-Detail for Cedar Rapids

Community	O&D Passengers With Cedar Rapids 1967	1974	1974 % of 1967	Service Quality With Cedar Rapids 1967	1974	Steps Better (Worse)	Natural Growth Group
Omaha, Neb.	7,810	4,250	54%	1	5	(4)	S
Toledo, O.	390	1,300	333	4	7	(3)	F
Des Moines, Ia. 1/	4,910	2,320	47	1	3	(2)	S
Detroit, Mich.	3,940	6,060	154	4	6	(2)	F
Median			104%			(3)	
Chicago, Ill.	48,530	56,430	116	-1	0	(1)	S
Indianapolis, Ind.	1,470	1,980	135	6	7	(1)	A
Lincoln, Neb.	800	1,250	156	4	5	(1)	A
Louisville, Ky.	580	1,260	217	7	8	(1)	F
Miami, Fla.	3,090	3,620	117	5	6	(1)	S
Rochester, Minn.	1,540	930	60	3	4	(1)	S
Median			126%			(1)	
Atlanta, Ga.	1,260	3,530	280	5	5	0	F
Boston, Mass.	4,310	6,000	139	5	5	0	A
Buffalo, N.Y.	900	1,330	148	5	5	0	A
Cincinnati, O.	1,230	2,470	201	6	6	0	A
Hartford, Conn.	1,530	1,890	124	5	5	0	S
Oklahoma City, Okla.	810	1,210	149	10	10	0	A
Philadelphia, Pa.	3,980	4,800	121	5	5	0	S
Seattle, Wash.	1,950	3,570	183	7	7	0	A
Sioux City, Ia.	1,180	2,340	198	6	6	0	A
Tampa, Fla.	1,520	2,830	186	6	6	0	A
Tulsa, Okla.	570	1,350	237	7	7	0	F
Median			183%			0	
Cleveland, O.	2,900	3,320	114	4	3	1	S
Dallas, Tex.	3,180	5,650	178	7	6	1	A
Dayton, O.	1,270	2,570	202	6	5	1	A
Ft. Lauderdale, Fla.	na	1,660	na	7	6	1	A
Honolulu, Haw.	462	1,530	331	8	7	1	F
Kansas City, Mo.	10,620	11,100	105	2	1	1	S
Las Vegas, Nev.	910	4,320	475	7	6	1	F
Lexington, Ky.	200	1,080	540	10	9	1	F
Los Angeles, Calif.	10,040	16,840	168	6	5	1	A
Milwaukee, Wis.	4,470	5,870	131	4	3	1	S
Minneapolis, Minn.	15,520	23,260	150	3	2	1	S
New Orleans, La.	1,110	2,300	207	8	7	1	A
New York, N.Y.	14,930	17,750	119	5	4	1	S
Phoenix, Ariz.	1,780	4,390	247	7	6	1	F
Pittsburgh, Pa.	1,770	2,730	154	5	4	1	S
Portland, Ore.	1,000	2,010	201	7	6	1	A
Raleigh, N.C.	380	1,130	297	7	6	1	F
San Antonio, Tex.	350	1,020	291	8	7	1	F
San Diego, Calif.	1,530	2,810	184	8	7	1	A
San Francisco, Calif.	6,330	7,070	112	6	5	1	S
Toronto, Can.	382	2.190	573	6	5	1	F
Tuscon, Ariz.	400	980	245	8	7	1	F

(continued)

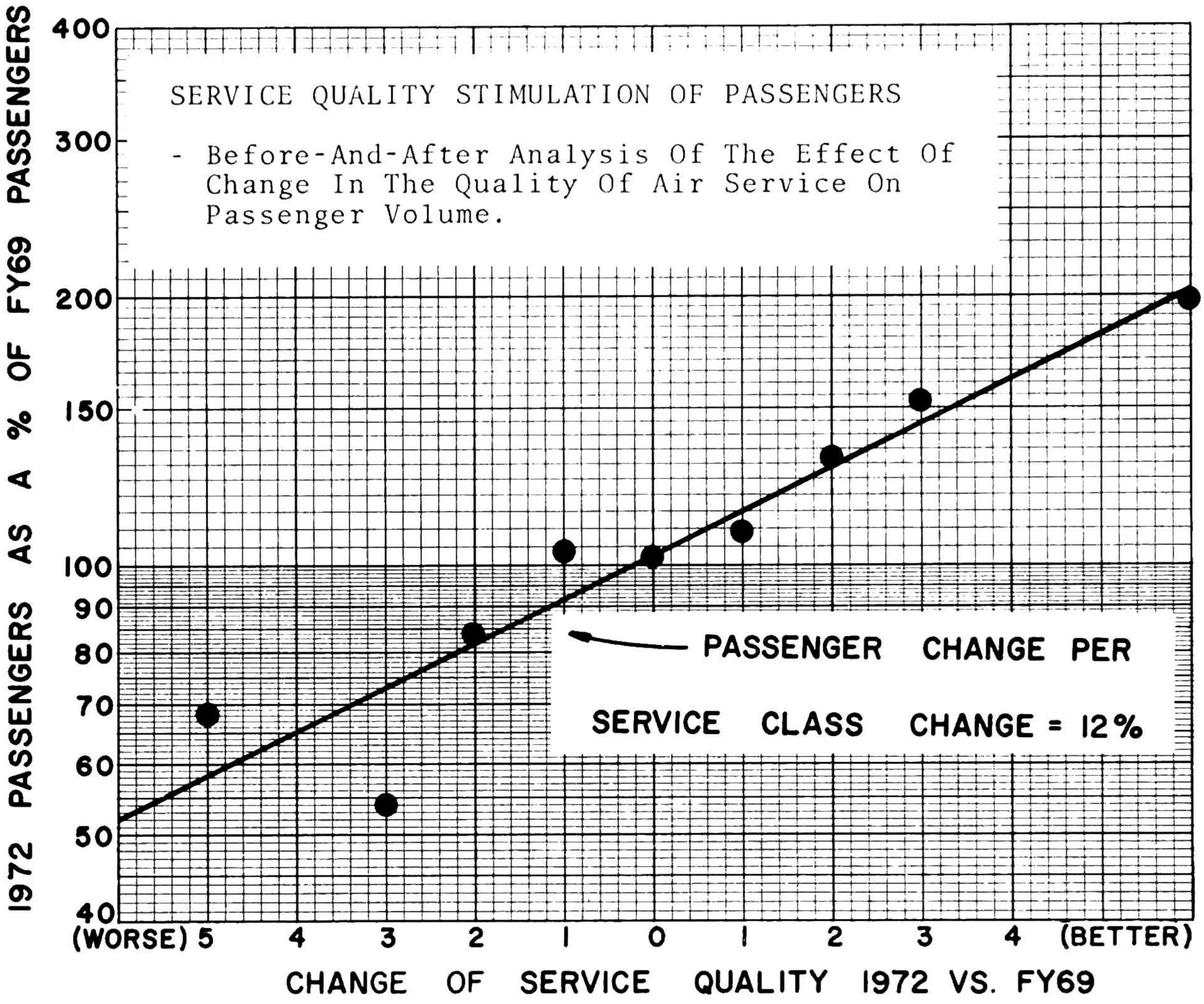
Community	O&D Passengers With Cedar Rapids 1967	1974	1974 % of 1967	Service Quality With Cedar Rapids 1967	1974	Steps Better (Worse)	Natural Growth Group
(Group 1, continued)							
Tucson, Ariz.	400	980	245	8	7	1	F
Washington, D.C.	6,790	11,830	174	5	4	1	A
Wichita, Kans.	760	1,690	222	8	7	1	A
Median			201%			1	
Baltimore, Md.	2,270	2,770	122	6	4	2	S
Columbus, O.	1,350	2,750	204	6	4	2	A
Houston, Tex.	1,020	2,190	215	8	6	2	A
Memphis, Tenn.	680	1,380	203	10	8	2	A
Oakland, Calif.	na	1,130	na	9	7	2	A
Orlando, Fla.	440	1,540	350	8	6	2	F
Salt Lake City, Utah	510	1,070	210	7	5	2	A
Median			207%			2	
Denver, Colo.	5,400	13,780	255	5	2	3	A
Nashville, Tenn.	650	1,340	206	10	7	3	S
Norfolk, Va.	520	1,240	238	7	4	3	A
Sacramento, Calif.	370	1,390	376	9	6	3	F
St. Louis, Mo.	7,470	11,230	150	5	2	3	S
San Jose, Calif.	10	1,170	2/	10	5	5	F
Sioux Falls, S.D.	210	1,050	500	11	6	5	F
Median			255%			3	
Total	200,284	289,040					

1/ Data for 1974 are adjusted, but not in the total. [to add commuter traffic]
2/ 11,700.

[Note: The codes in the final column are: F for fast, A for average, and S for slow natural growth, a three-way classification designed to explain part of the residual variation within the service-change groups. The classifications generally agree with variations in economic and population growth rates.]

Source: See page 2 of this appendix.

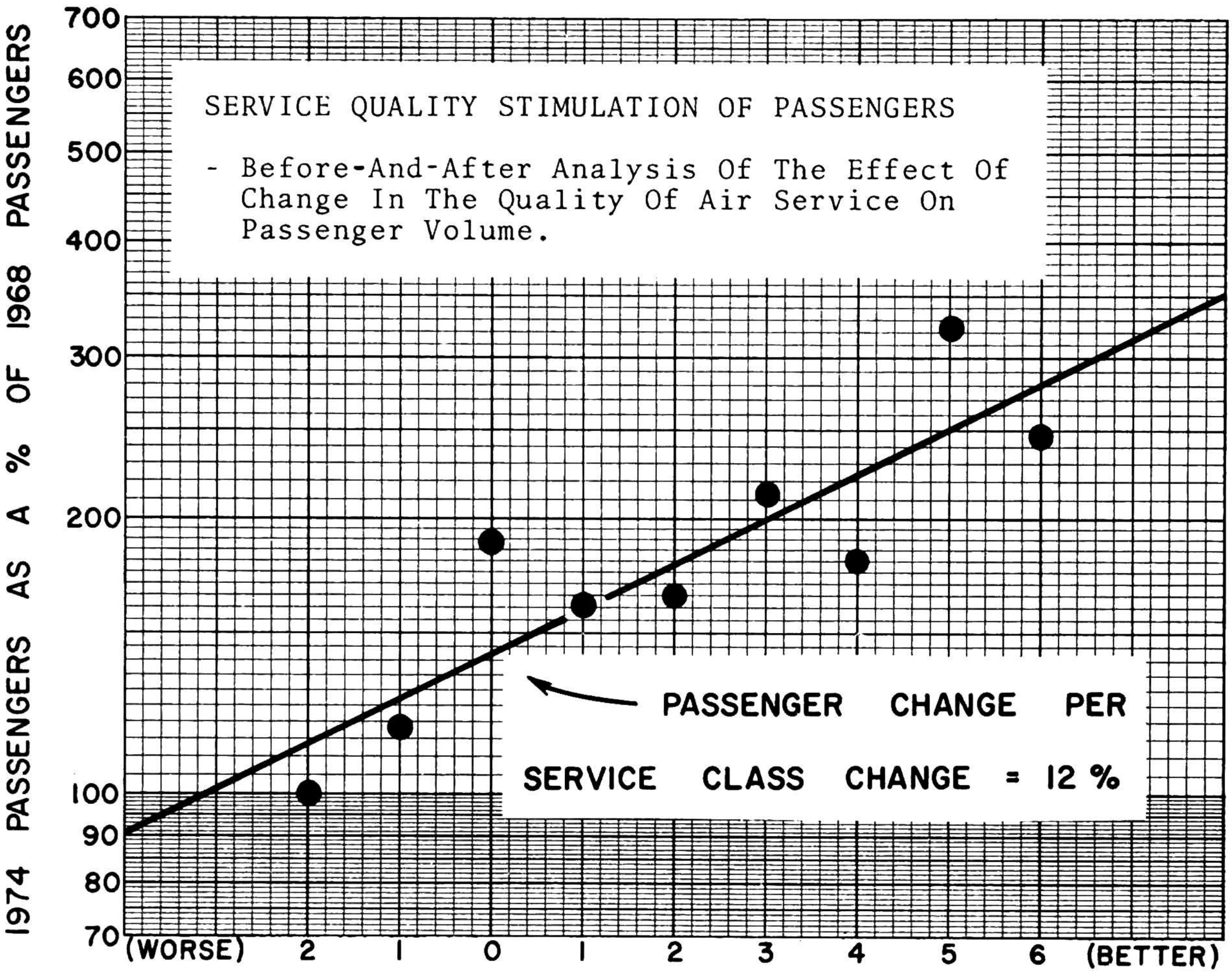
[*midwest medium hub*]



Service Steps Better (Worse)	1972 Passengers as a % of FY69 (Median)
(5)	68%
(3)	54
(2)	84
(1)	103
0	102
1	109
2	132
3	153
6	199

Source: See page 2 of this appendix.

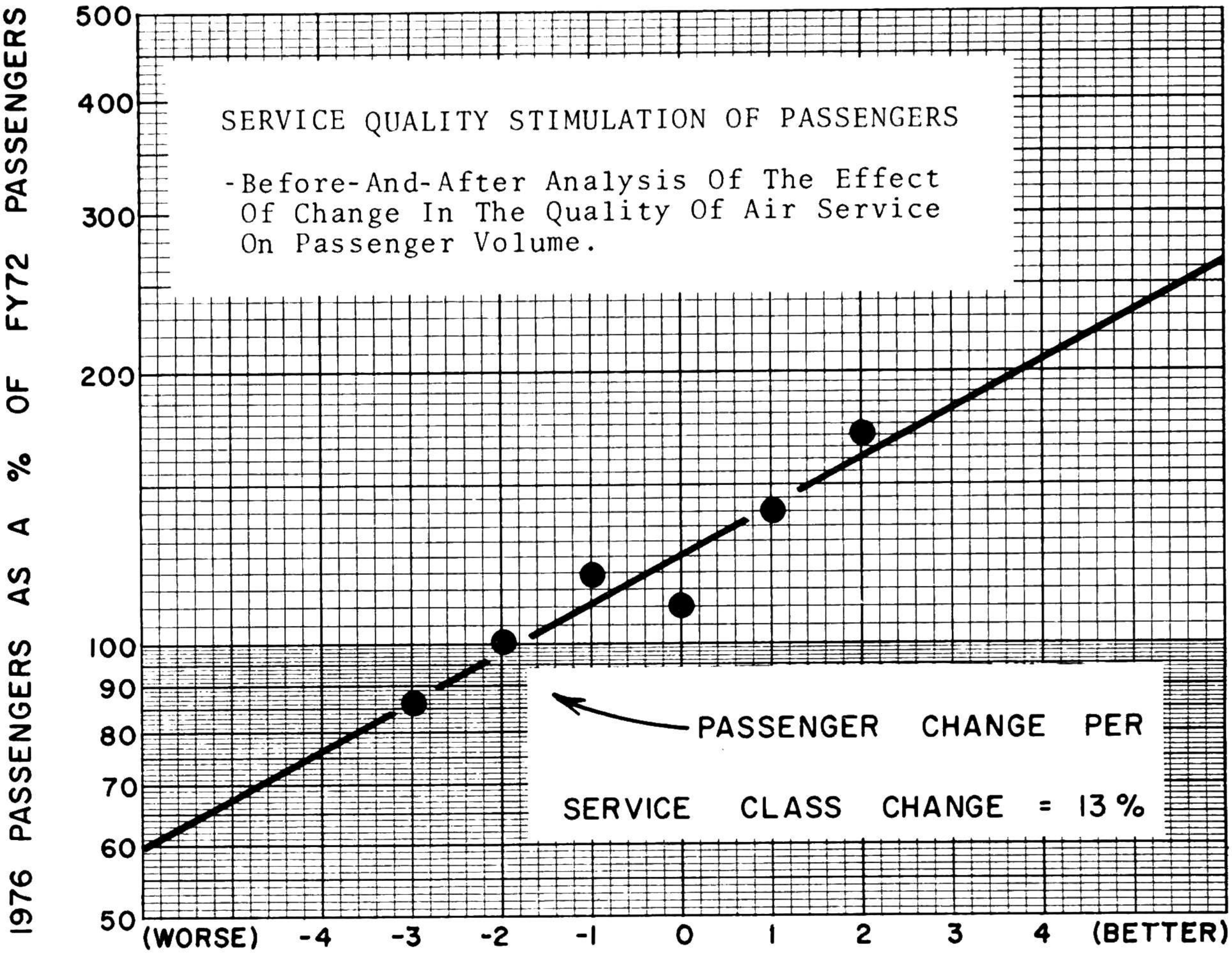
[*southern small hub*]



Service Steps Better (Worse)	1974 Passengers as a % of 1968 (Median)
(2)	100%
(1)	118
0	188
1	160
2	165
3	213
4	180
5	323
6	247

Source: See page 2 of this appendix.

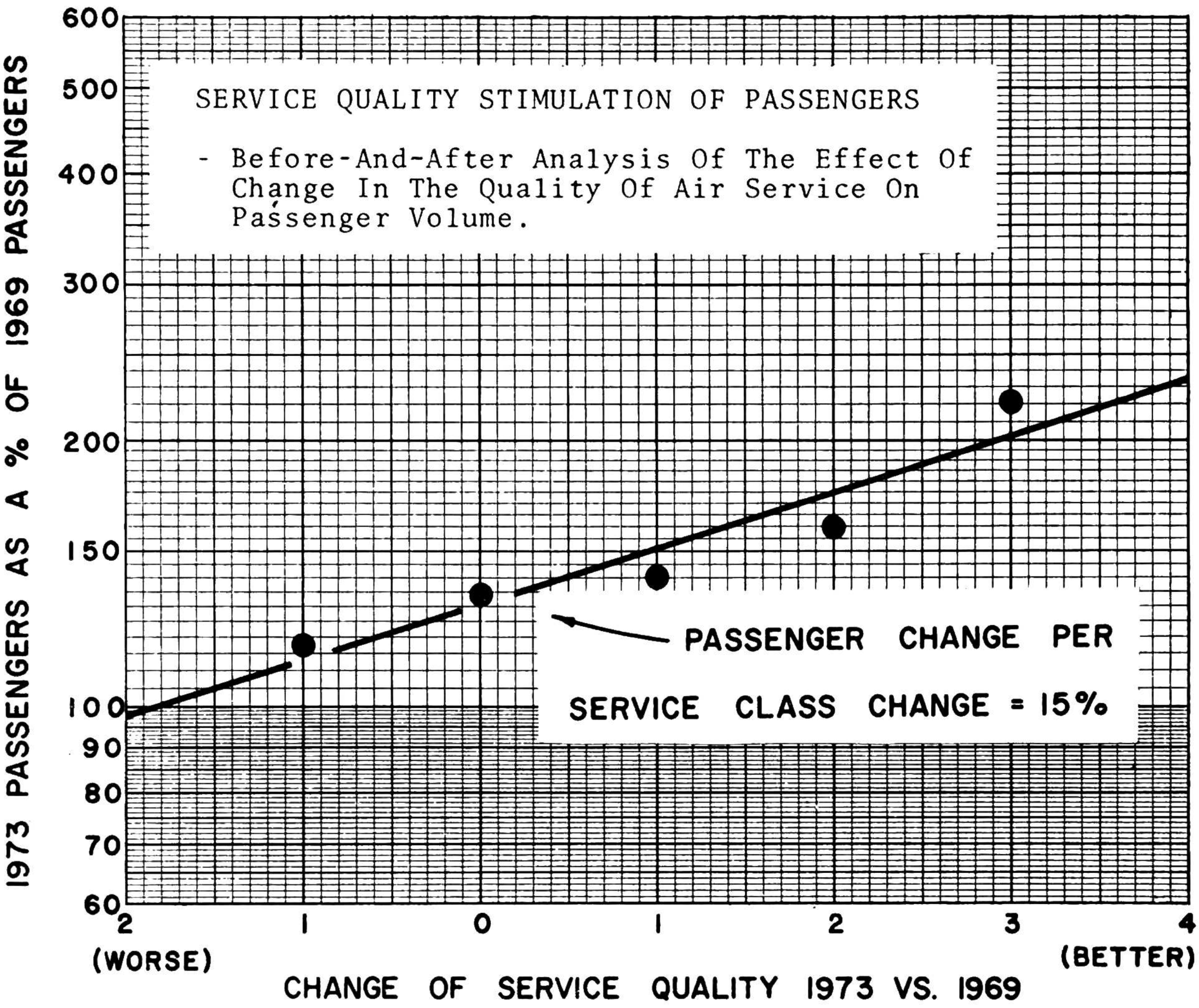
[*midwest small hub*]



Service Steps Better (Worse)	1976 Passengers as a % of FY72 (Mean Average)
(3)	86%
(2)	101
(1)	119
0	110
1	140
2	171

Source: See page 2 of this appendix.

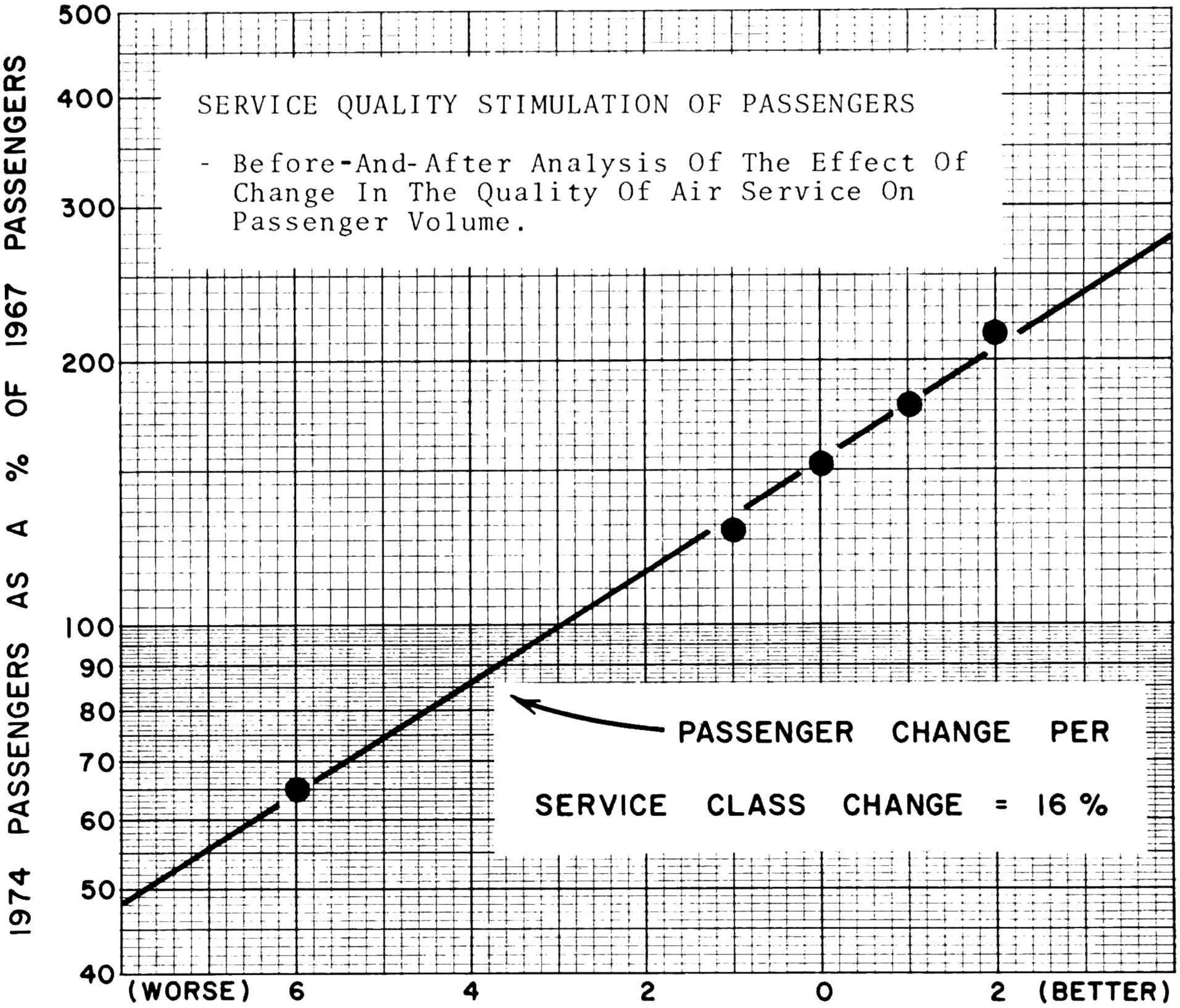
[*western large hub*]



Service Steps Better (Worse)	1973 Passengers as a % of 1969 (Median)
(1)	117%
0	134
1	140
2	160
3	221

Source: See page 2 of this appendix.

[*midwest small hub*]

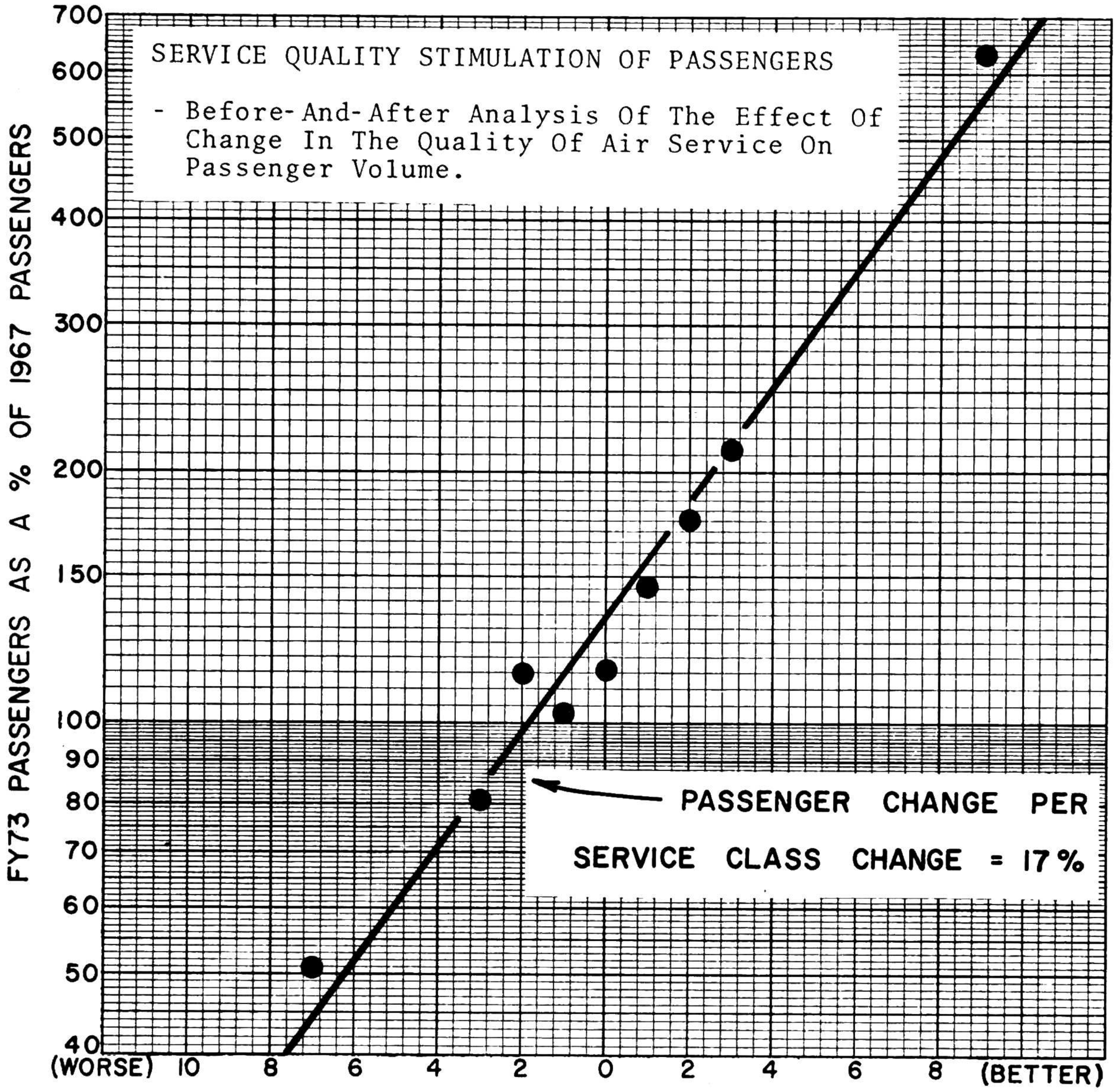


Service Steps Better (Worse)	1974 Passengers as a % of 1967 (Median)
(6)	65%
(1)	128
0	152
1	178
2	215

Source: See page 2 of this appendix.

[*Note: Slope seems steeper, because horizontal scale is condensed.*]

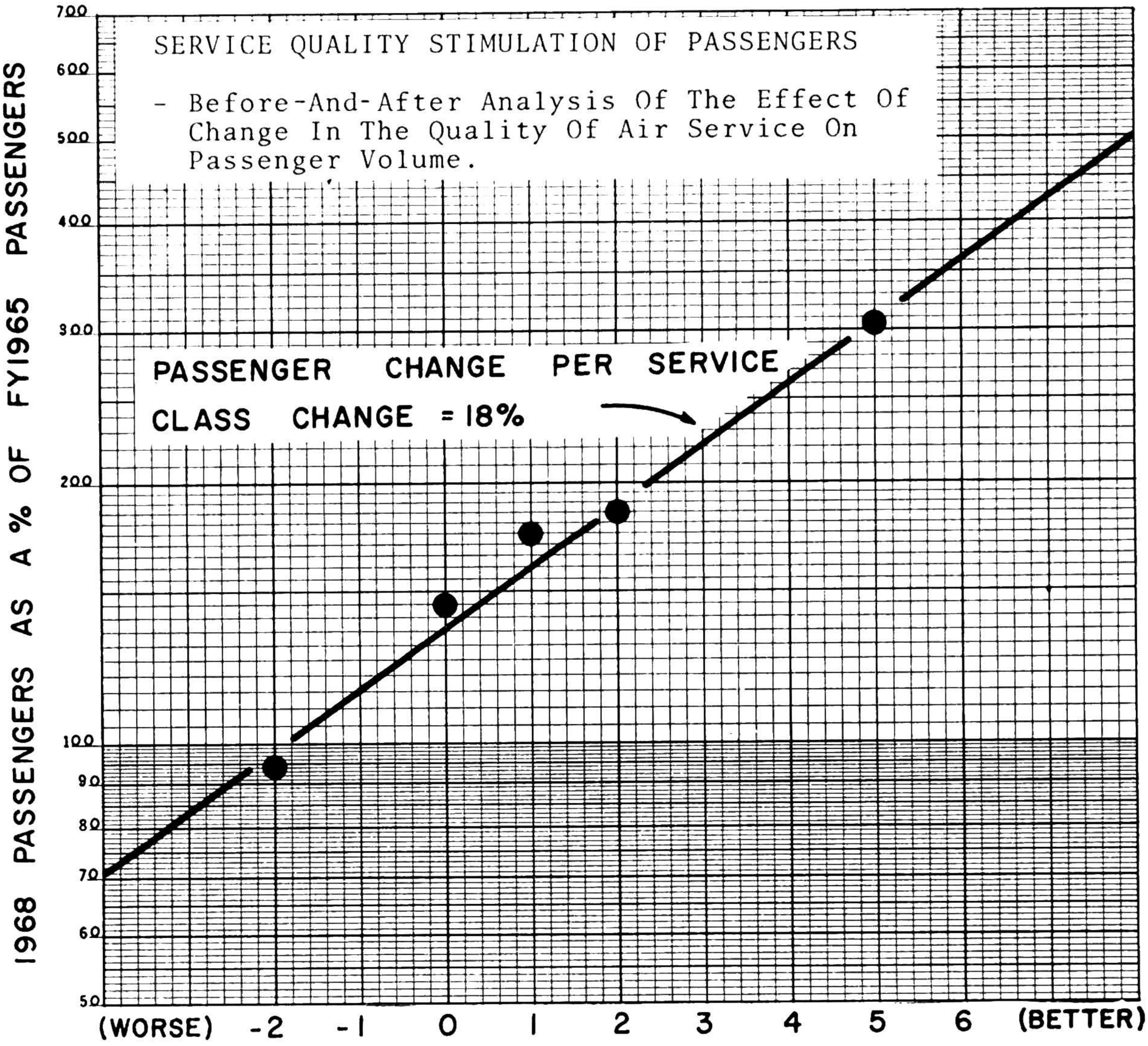
[*eastern large hub*]



Service Steps Better (Worse)	Fiscal Year 1973 Passengers as a % of 1967 (Mean)	Service Steps Better	Fiscal Year 1973 Passengers as a % of 1967 (Mean)
(7)	51%	1	146%
(3)	81	2	176
(2)	115	3	212
(1)	103	9	632
0	116		

Source: See page 2 of this appendix.

[*midwest large hub*]



Service Steps Better (Worse)	1968 Passengers as a % of FY1965 (Median)
(2)	94%
0	145
1	174
2	184
5	305

Source: See page 2 of this appendix.

EFFECT OF AIR SERVICE ON TRIP DURATION

Increased convenience in making a round trip by air creates an additional saving in travel expense by reducing the number of nights (and associated days) required to be spent away to obtain with reliability any given amount of usable time at the traveler's destination.

This saving can be conservatively estimated at about $50.00 per extra day (night) needed to cover such expenses as added lodging, tips, local transportation to and from lodging, additional meals out, and extra calls home. Sales Management magazine's estimate of lodging and meals alone for the average salesman in the U.S., for example, is $51.75 (in Washington, $77.10) per 1980 Survey of Selling Costs, February 25, 1980.

Each improvement of one service step leads to about 13.5 fewer nights away per 100 round trip passengers (see pages 2 and 3 of this appendix), which translates into $6.75 of added expense per service step per round-trip passenger ($3.38 per true O&D passenger).

The analyses on pages 2 and 3 of this appendix relate to Kansas City and to Philadelphia. Similar results (not shown) have also been obtained for the air travelers of other communities (Buffalo, Green Bay, South Bend, Youngstown).

Source: Adapted (and updated) from Rebuttal Exhibit CID-R-3 in the Iowa/Illinois-Atlanta Route Proceeding, Docket 30182.

- Markets With Poorer Service Require Travelers To Spend More Days Away Per Trip

- Kansas City

Trip Distance In Miles (1)	Number of Nights Away Per 100 Trips By Quality of Service: Better Service (2)	Poorer Service: Number (3)	Poorer Service: Added (4)	Average[a] Service Quality[b]: Better Service (5)	Poorer Service (6)	Steps Worse (7)	Added Nights Away Per 100 Trips Per Service Step (8)
0- 399	89	133	44	-1.7	1.7	3.4	12.9
400- 999	216	267	51	-1.6	2.5	4.1	12.4
1,000-1,999	303	354	51	0.0	3.1	3.1	16.5
2,000 & up	na	500	na	na	5.4	na	na
					Average		13.9

na Not available.

a/ Mean average service of all trips in the group.
b/ Quality of service using the same method as on pages 7 and 8 of this exhibit.* "Better" is here defined for distances between 0 & 399 miles as service better than Class 0, between 400 & 999 miles as better than Class 1, between 1,000 & 1,999 miles as better than Class 2, from 2,000 miles & up as better than Class 3, and "poorer" is defined as all poorer classes of service within each mileage group.

Source: Cols. (1)-(3), (5)&(6) - Exhibit MKC-26 in Docket 29001.
(4) - Col. (3) minus Col. (2).
(7) - Col. (6) minus Col. (5).
(8) - Col. (4) divided by Col. (7).

[* refers to the MacNeal Air Service Scale, Appendix M herein. This page taken from Exhibit CID-R-3 filed by the Cedar Rapids parties on October 3, 1977 in the Iowa/Illinois-Atlanta Route Proceeding, C.A.B. Docket 30182.]

- Philadelphia

Trip Distance In Miles (1)	Number Of Nights Away Per 100 Trips By Quality Of Service: Best Service (2)	Worse Service: Number (3)	Worse Service: Added (4)	Average a/ Service Quality b/: Best Service (5)	Worst Service: Quality (6)	Worst Service: Steps Worse (7)	Added Nights Away Per 100 Trips Per Service Step (8)
0- 399	113	183	70	-1.5	5.8	7.3	9.6
400- 999	193	296	103	-1.5	5.0	6.5	15.8
1,000-1,999	304	331*	27	0.0	2.2*	2.2	12.3
2,000 & up	c/	c/	na	c/	c/	na	na
					Average		12.6

* Intermediate quality service, worst service group has small base.
na Not available.

a/ Mean average service of all trips in the group.
b/ Quality of service using the same method as on pages 8 and 9 of this exhibit.** "Best" is here defined as service classes -2 through 0, and "worst" as classes 4 through 7.
c/ Small base (less than 20 responses; all others have a base of more than 50 responses).

Source: Cols. (1)-(3), (5)&(6) - Exhibit PHL-19 in Docket 21162
(4) - Col. (3) minus Col. (2).
(7) - Col. (6) minus Col. (5).
(8) - Col. (4) divided by Col. (7).

[** See page 2 facing]

Trips And Duration

It has been stated in previous papers and discussions that there are many substitutes for making a trip by scheduled air transportation. Among these would be long distance telephone calls in-lieu-of trips, the writing of letters, and the changing of location of branch offices to eliminate the need for trips that are difficult to make. Also, it has been pointed out that passengers can make fewer trips, but of longer duration. In the Los Angeles studies, an interesting fact is developed; namely, that the greater the distance from the airport, the greater the number of nights away per trip for the Los Angeles residents.

Approximate Distance From Airport	Average (Mode) Trip Duration in Nights Away From Home
Airport Area	3
Within 10 Miles	6
10 - 20 Miles	7
20 - 30 Miles	7
Over 30 Miles	8
Outside of Study Area	9

Does this mean that air travel is really very elastic in demand?

This is a matter about which it is important to speak very clearly. In this industry, we generally speak of "passengers" when we mean "passenger trips" and we speak of air "trips" when we mean air "travel" and vice versa. Thus, when we speak of 200,000 passengers, we really mean 200,000 one-way passenger trips. The amount of "people" engaged in this activity is much smaller than the number "200,000". The number of days that these travelers spend in "travel" is a function not only of the number of "trips", but also of the number of days spent away from home on each trip. These statements serve to illustrate how unclear our ordinary language is in speaking of these matters.

There is no doubt of the elasticity of demand for air trips. It has been illustrated in studies filed in case after case before the C. A. B. by communities, carrier parties, and the Bureau of Operating Rights. Yet, these studies are sometimes in conflict with the intuitive feeling that "when you have to make a trip, you have to make a trip."

The explanation is not just telephones or opening branch offices, or failing to respond to the need for the trip, as substitutes for travel, but also that there are fewer trips of longer duration. This can result in the same amount of time away from home spent in travel, but sizable reductions in the number of tickets sold by the carriers. Thus, ten trips of one day each and five trips of two days each yield the same amount of "travel", but only half as many ticket sales or "passengers" in the ordinary parlance. The following tabular data taken from the Los Angeles International Airport air passenger studies present important information regarding this question.

Approximate Distance From Airport	Modal Group Days Away Per Trip	Mean Average Air Trips Per Year	"Average" Days Away Per Year
Airport Area	3	14.40	43.20*
Within 10 Miles	6	11.59	69.54
10 - 20 Miles	7	10.41	72.87
20 - 30 Miles	7	10.21	71.47
Over 30 Miles	8	9.64	77.12
Outside Study Area	9	7.69	69.21
Median	7	10.31	72.17

* More unrepresentative of mean average days away per year than other figures, because of skewed distribution of days away per trip.

The amount of travel, measured by days away from home are about equal (with the exception noted), but the trips per year and the days away per trip vary substantially and in an inverse relationship, clearly demonstrating this aspect of the elasticity of demand for air trips.

Source: John F. Brown, "Air Passenger Trip Characteristics Affect Airport Accessibility Planning," American Institute of Aeronautics and Astronautics, paper No. 68-1070, 5th Annual Meeting, Philadelphia, October 21-24, 1968.

MACNEAL AIR SERVICE SCALE

-General introduction

The MacNeal Air Service Scale measures the quality of air service in terms of the convenience of making a round trip. Lower values represent better service; higher values, poorer service. The scale measures service from the most frequent nonstop patterns (Class -3, if shuttle service; Class -2 if reservation required) through various qualities of single-plane service (Class -1, 0, 1, 2, 3, 4, or higher, depending on distance) and connections (Classes 5 through 12, generally; up to about Class 25 on occasion; rarely higher).

The scale was developed in 1963; it has been tested on thousands of markets since that time, undergoing gradual refinement as indicated by such tests. The scale ignores flight frequency and capacity as such, and measures, instead, coverage of desired departure times on a round-trip basis, and equipment type in relation to length of trip. Stops, en route connections, connection time, circuity, and distance, also affect the final score.

The MacNeal scale is suitable for measuring most types of service change, and is calibrated to changes in the true O&D traffic, so that each point change on the scale produces an equal percentage change in traffic.

The exact scoring rules follow.

-Scoring rules

A. Analyze morning peak hour (6 a.m.-10 a.m.) departures to the base city or best alternative service earlier or later, using May schedules, for example.

1. Score one point to start.
2. Add one point for each scheduled stop enroute (not counting arrival at base city).
3. Add one point for propeller equipment, if flight is for 300-999 miles; and two points if 1,000 miles or more. Add an additional point for scheduled air commuter flights of less than 150 miles, and two points if 150 miles or more.
4. Add two points for each connection between flights.
5. Add one point if not departing between 6 a.m. and 10 a.m., inclusive; and an additional point if departing between 1 p.m. and 4:59 a.m., inclusive.
6. Add one point on connections for each hour or fraction thereof over a 90-minute connection.

B. Analyze afternoon peak hour (3:30 p.m.-7:30 p.m.) departures to the base city or best alternative service earlier or later in a similar way, except add one point if not departing between 3:30 p.m. and 7:30 p.m. inclusive, and an additional point if departing between 11:01 p.m. and 12:59 p.m., inclusive (except that on eastbound flights one-half hour earlier is permitted for each 300 miles or fraction thereof over 2,000 miles).

C. If there is only one schedule or connection a day possible, score the "second service" at the value of the "first service" plus five points. Never exceed this difference.

D. If <u>both</u> the morning and afternoon services involve connections, add one point to each of their scores.

E. For each connection used which requires a circuitous routing in excess of 20%, add one point for each 20% circuity or fraction thereof over the first 20% circuity.

F. Analyze schedules <u>from</u> the base city to the reference city exactly as outlined in items A-E above, using November schedules, for example.

G. Add all scores together and divide by four (4).

H. Provided there are flights of quality score 2 or better in all prime time periods, reduce the service score by one-half point if there are flights of quality score 2 or better (ignoring time penalty) in one direction in two and in the other direction in three or more of the four four-hour time periods from 6 a.m. to 10 p.m. (6-10:00 a.m., 10:01-2:00 p.m., 2:01-6:00 p.m., 6:01-10:00 p.m.), by one full point if both directions are covered in three of the four time periods, by one and one-half points if three time periods are covered in one direction and four in the other, and by two points if all four time periods are covered in both directions.

I. Reduce the service score by an additional one-quarter point if there are flights of quality score 1 (ignoring time penalty) in both directions in four or more of the eight two-hour time periods from 6 a.m. to 10 p.m. (6-8:00 a.m. 8:01-10:00, 10:01-1200 N, 12:01-2:00 p.m., 2:01-4:00, 4:01-6:00, 6:01-8:00, 8:01-10:00 p.m.) with no more than three of the 8:01-10:00 a.m. and the 4:01-10:00 p.m. periods missing, by one-half point if there are five or more such flights in both directions with no more than two of the 8:01-10:00 a.m. and the 4:01-10:00 p.m. periods missing, by three-quarters point if there are six or more such flights in both directions with no more than one of the 8:01-10:00 a.m. and the 4:01-10:00 p.m. periods missing, and by a full point if there are seven or more such flights in both directions with none of the 8:01-10:00 a.m. and the 4:01-10:00 p.m. periods missing.

J. Allowing a score proportional to one point for each 100 miles, add an amount equal to half of the excess over the allowable score (e.g., a score of 5.0 at 532 miles remains at score 5.0 without penalty; a score of 5.0 at 350 miles becomes 5.75, since only a score of 3.5 is allowable without penalty and half of 1.5 is .75).

K. In the alternative to items A through J above, use only services via the same connecting point, and, treating all as connections, proceed as before except as modified herein: provided there are prime time services of quality score 5 or 6 ignoring circuity (item E), then apply time coverage reduction (as in item H) to the non-overlapping best connecting services* of quality score 5 or 6 ignoring time penalty and circuity, and apply further time coverage reductions (as in item I) to such services of quality score 5 (treating connecting services of quality score 5 and 6 like flights of quality score 1 and 2 for the purposes of items H and I), and, after calculating the distance penalty (item J), reduce the score further by the lesser of the time coverage or the circuity.

L. Round the final result up if .50 or more remainder left; otherwise round down.

* Do not use a service leaving earlier but arriving no earlier, nor arriving later but leaving no later, nor scoring higher than another possible connection using the same flight.

Source: Scheduled Air Service Requirements at Columbia, S.C., 1979.

-Table of approximate scale values

APPROXIMATE SCHEDULE EQUIVALENTS TO AIR SERVICE CLASSIFICATIONS

Service Class	Schedule Pattern in BOTH Directions, Jet at 300 Miles or More	
	AM & PM Peak Hours	Mid-day and Evening
-2	Nonstop about every two hrs.	AND Nonstop about every two hrs.
-1	Nonstops	AND One-stops in both periods
0	Nonstops	AND One-stops in one period
1	Nonstops	-
2	One-stops	OR Nonstops*
3	Two-stops	OR One-stops*
4	Three-stops	OR Two-stops*
5	Nonstop connection	OR Three-stop single-plane*
6	One-stop connection	OR Nonstop connection*
7	Two-stop connection	OR One-stop connection*
8	(Connecting services between multi-stop flights at off-peak	
etc.	(hours with long connecting times, by poor schedules at	
	(short distances, and other unfavorable combinations.	

* Or equivalent mixtures.

Note A: This table is slightly inaccurate in that it shows too good a score for short-haul markets with the poorer services. It also presumes routings with a circuity of less than 20%.

Note B: Classes 2 through 5 could also be provided by a distribution of connecting services via any one point similar to the distribution of single-plane services for Classes -2 through 1.

The air service scale is based on the availability of service at times passengers desire to travel, rather than just on frequency. It measures the convenience of making a round trip, starting from either end of a city-pair.

Pages 1-3 of this appendix present the exact rules for service classification.

Source: "Scheduled Air Service Requirements at Columbia, S.C." (and similar studies). Wayne, Pa.: Edward MacNeal Associates, 1979.

SELECTED LIST OF USES OF SCALE

The MacNeal Air Service Scale (described in Appendix M) has had a wide use since 1963, including the following, among others:

Community Air Service Requirements Studies:

Boston, Mass.	Kansas City, Mo.
Buffalo, N.Y.	Louisville, Ky.
Butte, Mont.	Marshalltown, Ia.*
Cedar Rapids, Ia.	Norfolk, Va.
Cincinnati, O.	Philadelphia, Pa.
Columbia, S.C.	Portland, Ore.
Dayton, O.	Saginaw, Mich.
Denver, Colo.	Savannah, Ga.
Fort Dodge, Ia.*	Shreveport, La.
Fort Wayne, Ind.	South Bend, Ind.*
Grand Rapids, Mich.*	Toledo, O.*
Green Bay, Wis.	Tulsa, Okla.
Jacksonville, Fla.	Youngstown, O.*

Civil Aeronautics Board Cases:

Docket 16584, Louisville-Indianapolis Local Service Investigation; Louisville exhibits, 1966.

Docket 16474, Allegheny Airlines, Inc., Segment 8 Renewal and Route Realignment Investigation; Trenton exhibits, 1966.*

Docket 15459, Reopened Pacific Northwest-Southwest Service Investigation; Denver exhibits, 1967.

Docket 17436, Allegheny Airlines Route 97 Investigation; Trenton exhibits, 1967.*

Docket 18799, Denver-Calgary Service Case; Denver exhibits, 1968.

* Matters involving alternate airport complications.

Docket 19692, Milwaukee Short-Haul Investigation; Green Bay exhibits, 1969.

Docket 19362, Additional Service to Columbia and Augusta Case; Columbia, S.C., exhibits, 1969.*

Docket 19078, Northeast Corridor VTOL Investigation; Philadelphia exhibits, 1969.*

Docket 22916, American-Western Merger Case; Butte exhibits, 1971.

Docket 18104, Remanded Additional Service to San Diego Case; Denver exhibits, 1971.

Docket 23676, Application of Compania Mexicana de Aviacion, S.A.; Denver exhibits, 1971.

Docket 24089, Complaint of Dayton Parties with Respect to Dayton-Chicago Service; Dayton exhibits, 1971.

Docket 25397, American-Frontier Route Exchange Agreement; Kansas City exhibits, 1973.

Docket 20472, Philadelphia-Camden-Rochester/Syracuse Case; Philadelphia exhibits, 1974.

Docket 28778, Additional Dallas/Fort Worth-Kansas City Nonstop Service Case; Kansas City exhibits, 1976.*

Docket 20421, Oklahoma-Denver-Southeast Points Investigation; Denver exhibits, 1976.

Docket 28194, Eastern-Piedmont Route Exchange Agreement; Columbia, S.C., exhibits, 1976.

Docket 30277, Chicago-Midway Low-Fare Route Proceeding; Kansas City exhibits, 1977.*

Docket 30182, Iowa/Illinois-Atlanta Route Proceeding; Cedar Rapids exhibits, 1977.

Docket 30570, Service to Brunswick and Savannah Case, Savannah exhibits, 1977.*

Docket 32381, Spokane-Vancouver Route Proceeding; Denver exhibits, 1978.

Docket 32115, Boise-Denver Nonstop Proceeding; Denver exhibits, 1978.

Docket 33220, Yucatan Service Case; Kansas City exhibits, 1979.*

Docket 29058, Norfolk-Atlanta Subpart M Proceeding; Norfolk exhibits, 1977.

* Matters involving alternate airport complications.

Other Types of Studies Using Service Scale:

"Review of November, 1970, Schedules in 25 Selected Columbia Markets," 1970 (and similar studies for other communities, typically on a semiannual basis).

"Kansas City Scheduled Air Passenger Forecasts," 1972, including analysis of the effect of changing airports.*

"Combined Gateway Development and Master Air Service Plan for Kansas City," 1972.

"Analysis of Minimum Number of Flights Needed to Provide Service of the Quality Required," 1975 and later, both to determine the least flights required; and the geographic pattern of service, flight itineraries, and hourly patterns resulting from the constraint.

"South Bend Area Air Travel Survey," 1977, including analysis of traveler complaints and duration of trip relative to air service quality (and similar studies for other communities).*

"Market Potential for Henson Aviation De Havilland Dash 7 Service at Newport News, Va.," 1979, including analysis of the interrelationship of the Norfolk and Newport News air traffic markets and the effect thereon of changes in schedules and ground access (removal of toll and reduction in driving time).*

"Air Wisconsin New Route Development at Fort Wayne, Ind.," 1979, including analysis of the Fort Wayne-Pittsburgh market.

"Norfolk-Pittsburgh Service Proposal," January, 1979, (and similar analyses of the profitability of proposed new airline services performed for other city-pairs).

"Commuter New Route Development at Columbia, S.C.," 1980, including analysis of Columbia's hubbing potential (and similar studies for other communities).

* Matters involving alternate airport complications.

Source: As cited.

SELECTED LIST OF ALTERNATE AIRPORT SITUATIONS

Stations	Miles Apart
Albany, N.Y.-Glens Falls, N.Y.	42
Albuquerque, N.M.-Santa Fe, N.M.	49
Appleton, Wis.-Green Bay, Wis.	25
Asheville, N.C.-Greenville, S.C.	41
Baltimore, Md.-Washington, D.C.	37
Birmingham, Ala.-Gadsden, Ala.	48
Boston, Mass.-Worcester, Mass.	45
Bridgeport, Conn.-New Haven, Conn.	14
Charlotte, N.C.-Hickory, N.C.	44
Charlottesville, Va.-Staunton, Va.	25
Cleveland, O.-Akron, O.	41
Colorado Springs, Colo.-Pueblo, Colo.	37
Daytona Beach, Fla.-Titusville, Fla.	44
Denver, Colo.-Colorado Springs, Colo.	67
Eugene, Ore.-Corvallis, Ore.	26
Evansville, Ind.-Owensboro, Ky.	30
Fayetteville, N.C.-Southern Pines, N.C.	34
Flint, Mich.-Detroit, Mich.	53
Fort Dodge, Ia.-Des Moines, Ia.	75
Fresno, Calif.-Visalia, Calif.	36
Galveston, Tex.-Houston, Tex.	46
Grand Rapids, Mich.-Muskegon, Mich.	41
Indianapolis, Ind.-Bloomington, Ind.	44
Islip, N.Y.-New York, N.Y.	45
Jackson, Mich.-Detroit, Mich.	66
Jacksonville, Fla.-Brunswick, Ga.	51
Kansas City, Mo.-Topeka, Kans.	56
Kinston, N.C.-Goldsboro, N.C.	19
Melbourne, Fla.-Vero Beach, Fla.	34
Newport News, Va.-Norfolk, Va.	23
Omaha, Nebr.-Lincoln, Nebr.	55
Orlando, Fla.-Titusville, Fla.	34
Pittsburgh, Pa.-Youngstown, O.	57
Portland, Ore.-Salem, Ore.	51
Reno, Nev.-Lake Tahoe, Calif.	43
Roanoke, Va.-Pulaski, Va.	41
South Bend, Ind.-Benton Harbor, Mich.	30
Syracuse, N.Y.-Utica, N.Y.	37
Toledo, O.-Detroit, Mich.	59
Trenton, N.J.-Philadelphia, Pa.	27

Source: C.A.B. Airline Traffic Survey.

EFFECT OF AIRPORT ACCESSIBILITY ON THE STIMULATION OF AIR PASSENGER TRAFFIC

There are many studies which demonstrate that the effect of airport accessibility on passenger traffic is both significant and in the direction indicated by economic theory. These studies cover one or more airports east and west, north and south, large and small, over many years; they include such a variety of situations and analyses as to leave no doubt about the general stimulative effect of good airport accessibility on passenger traffic, as shown by the following synopses:

STUDIES OF AIRPORT ACCESSIBILITY EFFECT

1. Passengers per thousand population:

   a. Effect of distance on air passengers per thousand population at Buffalo. Study filed by Niagara Falls in C.A.B. Docket 6125, the Niagara Falls Airport Case, 1953.

      Showed successive drops in passengers per thousand population as airport distance increased, from 393 at 0-15 miles, to 307 at 15-20 miles, 135 at 20-25 miles, and 84 beyond 25 miles.

   b. Effect of distance on air passengers per thousand population at 21 California airports. Study filed by Dallas in Docket 5592, Reopened Service to Fayetteville, 1955.

      Showed areas 10-20 miles from each of the 21 airports lost traffic per thousand population relative to areas 0-10 miles from the same airports, and the mean average loss was 65.7%.

   c. Effect of ground accessibility on air passengers per thousand population at Butte. Study included in "Traffic and Economic Analyses Related to Airport Relocation Feasibility at Butte, Montana," 1971, performed for the Silver Bow County Airport Board.

      Showed successive drops in passengers per thousand population as the average of airport ground miles and minutes increased, from 5.4 per thousand at an average of 4, to 4.8 at 7, to 4.0 at 9, to 2.6 at 28, to 1.9 at 59, to 1.5 at 78, and to 0.4 at 166.

2. Passengers per thousand population, closed system:

   a. Effect of distance on passengers per thousand population at ten Wisconsin airports with contiguous air service areas, eliminating areas closer to airports beyond the ten. Study filed by Green Bay in Docket 13743, the North Central Area Airline Service Airport Investigation, 1963.

      Showed successive losses of passengers per thousand population as distance from airports increased, from 258 at 0-10 miles, to 56 at 11-20 miles, to 40 at 21-30 miles, to 16 at 31-40 miles, to 3 at 41-50 miles, to 1 at 51-60 miles, to 0 at 61-70 miles.

3. Passengers per thousand population, adjusted for income, by length of trips:

   a. Both long-haul and short-haul air traffic are lost when airports are distant from traffic-generating centers. Study filed by Dallas in Docket 5592, Reopened Service to Fayetteville, 1955.

      Study showed successive loss of passengers per thousand population (adjusted for income) from 0 miles up to 13 miles from Dallas Love Field. Comparing the 10-13 mile band with the 2-4 mile band, air trips showed a 100% loss in the 0-99 mile band, an 83% loss in the 200-249 mile band, and a 79.5% loss in the band over 1,000 miles.

4. Passengers by airport with best service:

   a. Study of the Effect of Airport Accessibility on Realization of Air Passenger Potential, New Jersey-New York Metropolitan Area. Report for Port of New York Authority, Landrum and Brown, 1961.

      Showed New Jersey counties lost an average of 24% of their passengers when the better service was at the Long Island airports, and the Long Island counties lost an average of 23% of their passengers when the better service was at Newark, a distance of about 17 miles.

5. Trip frequency and duration by airport accessibility:

   a. Survey of Los Angeles International Airport Scheduled Air Passenger Market. Study for the Los Angeles Department of Airports, Landrum and Brown, 1968.

      Showed decreases in annual trips per traveler and increases in duration of trip as local airport distance increases. Within the immediate airport zone there was an average of 14.40 trips of 3 days each per passenger, which fell in successive mileage bands to 11.59 trips of 6 days each, 10.41 trips of 7 days each, 10.21 trips of 7 days each, 9.64 trips of 8 days each, and 7.69 trips of 9 days each.

6. Passengers before and after airport move:

   a. Detroit passengers with selected cities before and after airport change in 1946 from Detroit Municipal to Willow Run. Study filed by Dallas in Docket 5592, and an updated version filed by Midland/Bay City/Saginaw in Docket 14288, the Michigan Area Airline Service Airport Case, 1963.

      Showed Detroit lost 46% of its traffic with large metropolitan areas within 300 miles, relative to their traffic with each other, when scheduled service was moved 25 miles farther from downtown. See graph on page 4 of this appendix.

   b. Dallas and Fort Worth passengers with selected cities before and after Fort Worth airport change. Study filed by Dallas in Docket 5592, Reopened Service to Fayetteville case, 1955, and an updated version filed by Niagara Falls in Docket 6436, The Northeastern States Area Investigation, 1957.

      Showed Fort Worth lost 35% of its traffic relative to Dallas with cities where the only change in service at Dallas or Fort Worth was the change of Fort Worth's airport for scheduled air service from Meacham to Fort Worth International, 13 miles farther from the city. See graph on page 5 of this appendix.

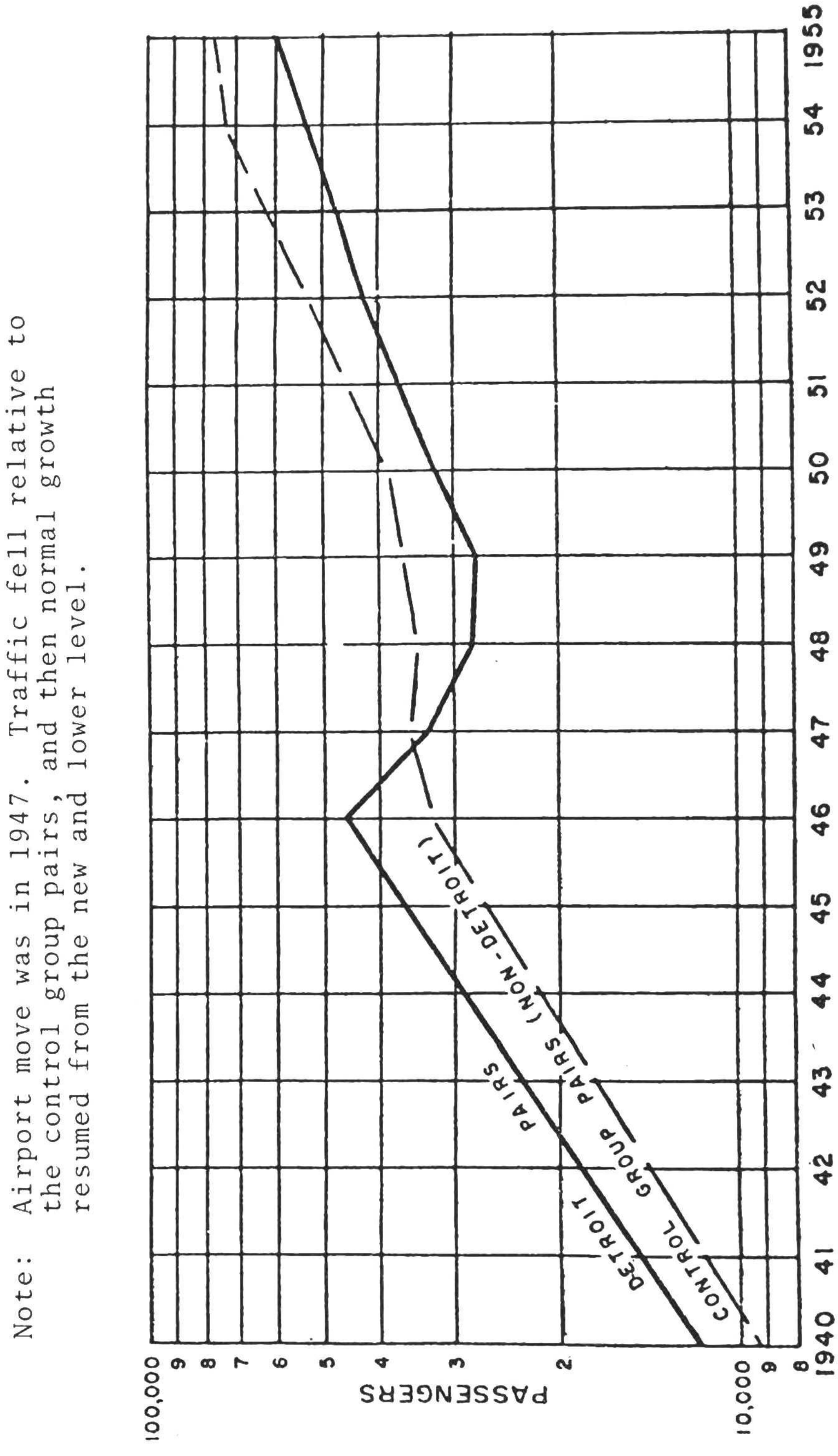
   c. Kansas City passengers in total and by air trip distance before and after airport change. Study filed by Kansas City in Docket 28778, the Additional Dallas/Fort Worth-Kansas City Nonstop Service Case, 1976, and later cases.

      Showed Kansas City lost 10% of its total traffic relative to the U.S. when scheduled service was moved from Kansas City Municipal to Kansas City International, 16 miles farther from the city. The study also showed losses of traffic in all air trip mileage bands.

      (See Appendix Q herein for details.)

Source: As given for each study.

WHEN DETROIT MOVED ITS AIRPORT TO A POINT 25 MILES FARTHER AWAY, IT LOST SIGNIFICANT AMOUNTS OF AIR TRAFFIC



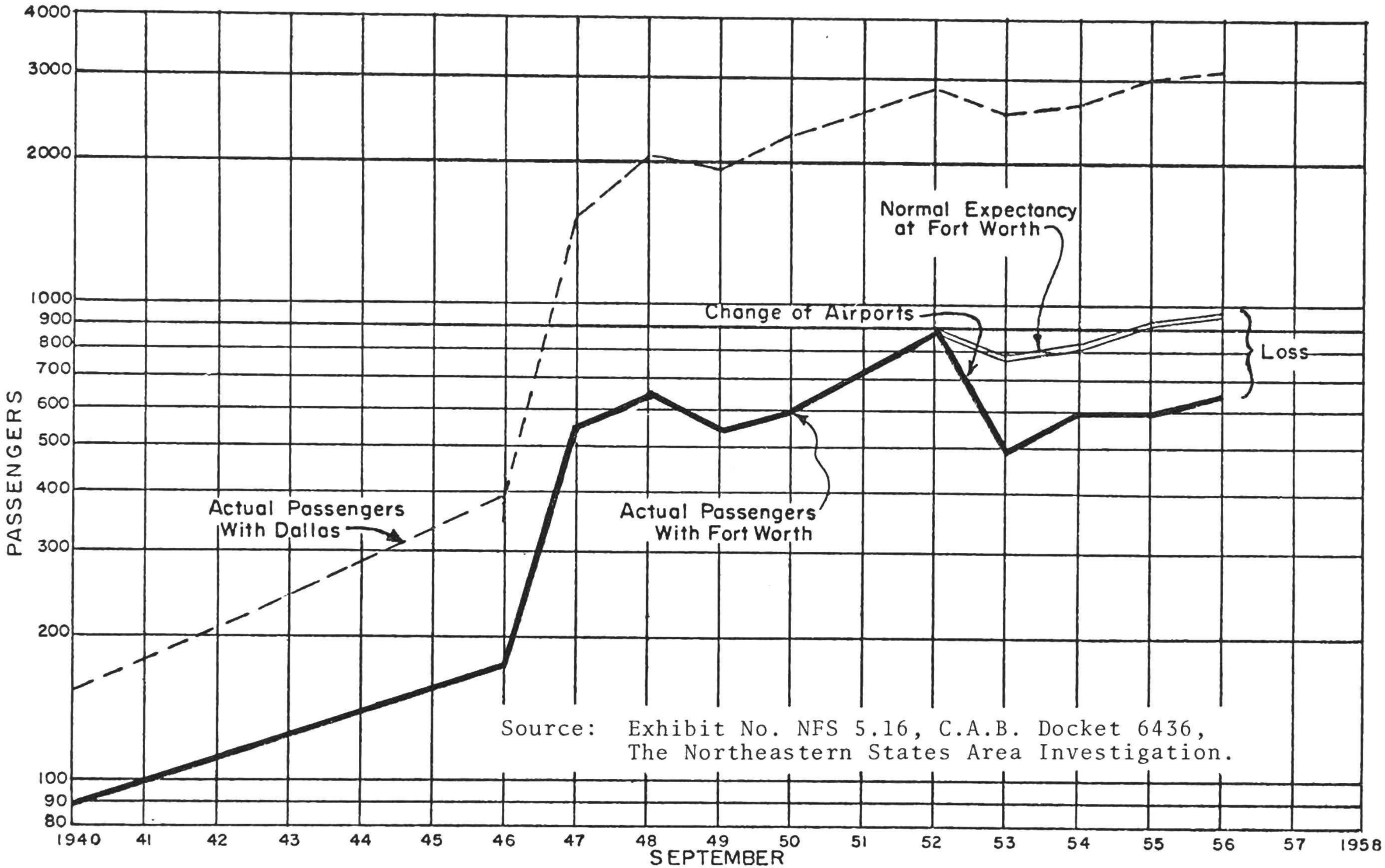
HISTORICAL TRAFFIC DEVELOPMENT OF DETROIT PAIRS AND CITY PAIRS IN THE CONTROL GROUP
1940-1955

Note: Airport move was in 1947. Traffic fell relative to the control group pairs, and then resumed from the new and lower level.

SOURCE: Exhibit No. MBS-805, C.A.B. Docket 14288, the Michigan Area Airline Service Airport Investigation.

AIRPORT DISTANCE INHIBITS FULL DEVELOPMENT OF AIR TRAFFIC

Fort Worth Lost 30% to 40% of Its Available Traffic With A Sample Group of Cities When Its Airport Was Changed From 5½ Miles to 18 Miles From the City Center



Source: Exhibit No. NFS 5.16, C.A.B. Docket 6436, The Northeastern States Area Investigation.

THE DEPRESSING EFFECT OF DISTANT AIRPORTS IS NOT CONFINED TO SHORT-HAUL TRIPS

Facts taken from studies performed by Kansas City and offered in public evidence in many Civil Aeronautics Board proceedings[1/] demonstrate conclusively that the depressing effect of distant airports is not confined to short haul trips.

The facts regarding Kansas City are presented on pages 2 through 6 of this appendix. They demonstrate that traffic fell 10% when Kansas City's scheduled air service was moved from an airport two miles from town to one 18 miles from town.[2/] Breaking this down by length of air trips shows losses of traffic in all mileage bands (0-299 miles - 11%, 300-599 miles - 7%, 600-999 miles - 10%, 1,000 miles and up - 15%).

1/ For example, direct exhibits filed: June 22, 1976, in C.A.B. Docket 28778, the Additional Dallas/Fort Worth-Kansas City Nonstop Service Case; August 4, 1976, in Docket 28961, the Sacramento-Denver Nonstop Proceeding: January 21, 1977, in Docket 29789, the Houston/New Orleans-Yucatan Route Proceeding; May 16, 1977, in Docket 29001, the TWA-Southern Route Exchange Case; November 28, 1977, in Docket 30277, the Chicago-Midway Low-Fare Route Proceeding; May 26, 1978, in Docket 28475, the St. Louis-Kansas City Subpart M Proceeding; also May 26, 1978, in Docket 32061, the St. Louis/Kansas City-San Diego Route Proceeding; December 5, 1978, in Docket 33216, the Louisville-Kansas City Nonstop Route Investigation; February 23, 1979, in Docket 33220, the Yucatan Service Case; April 16, 1979, in Docket 33477, the Texas/Great Lakes-Eastern Canada Service Investigation; and September 7, 1979, in Docket 34136, the Chicago/Texas/Southeast-Western Mexico Route Proceeding.

2/ Compare, for example, Washington National Airport at three miles from town and Dulles at 26 miles.

Source: Objections of Norfolk Port and Industrial Authority to Metropolitan Washington Airports Final Rule and Policy, F.A.A. Dockets 19948 and 19950, filed October 20, 1980.

THE DEPRESSING EFFECT OF DISTANT AIRPORTS IS NOT CONFINED TO SHORT-HAUL TRIPS

- Origin-Destination Passengers
  At Kansas City Vs. U.S. Total

Year	Duplicated U.S. Total	Kansas City	Kansas City % of U.S.	
1955	61,058,094	740,274	1.21%	)
1956	67,673,160	839,208	1.24	)
1957	73,832,556	896,154	1.21	)
1958	74,431,890	943,602	1.27	) Old
1959	77,725,120	977,000	1.26	)
1960	77,736,720	983,440	1.27	) Airport
1961	80,284,900	1,028,570	1.28	)
1962	85,507,260	1,082,200	1.27	) Two
1963	98,094,240	1,221,850	1.25	)
1964	111,393,040	1,395,260	1.25	) Miles
1965	131,166,940	1,659,320	1.27	) From
1966	150,137,560	1,908,510	1.27	)
1967	176,869,640	2,201,450	1.25	) Town
1968	207,491,100	2,641,030	1.27	)
1969	223,393,560	2,822,080	1.26	)
1970	215,903,360	2,683,240	1.24	)
1971	216,533,180	2,673,030	1.23	)
1972	238,533,540	2,832,530	1.19*	) Transition
1973	254,948,380	2,785,530	1.09	) New
1974	263,623,260	2,858,040	1.08	) Airport
1975	257,579,060	2,910,560	1.13	) 18
1976	274,494,320	3,085,460	1.12	) Miles
1977	298,928,180	3,298,370	1.10	) From
1978	343,888,580	3,824,190	1.11	) Town

* Airport relocation, November 11, 1972.

Source: C.A.B. Airline Traffic Survey, Table 1.

- By Mileage Bands

A. Summary of Percent of U.S.

Year	Kansas City Share Of Total U.S. Passengers By Mileage Bands 0-299	300-599	600-999	1,000 & Up	Total	
1970	.89%	1.67%	1.16%	1.23%	1.24%)	Old
1971	.89	1.67	1.14	1.19	1.23)	Airport
Avg	.89	1.67	1.15	1.21	1.235)	
1972	.86	1.63	1.09	1.13	1.19)	Transition
1973	.70	1.53	1.04	1.07	1.09)	
1974	.75	1.51	1.02	1.03	1.08)	New
1975	.78	1.57	1.07	1.07	1.13)	
1976	.77	1.55	1.08	1.05	1.12)	Airport
1977	.79	1.51	1.04	1.03	1.10)	
1978	.79	1.56	1.04	1.03	1.11)	

Source: Sections C through F.

B. Percentage Loss

Year	Percent Loss In Kansas City's Share of U.S. By Mileage 0-299	300-599	600-999	1,000 & Up	Total	
1972	3%	2%	5%	7%	4%)	Transition
1973	21	8	10	12	12)	
1974	16	10	11	15	13)	New
1975	12	6	7	12	9)	
1976	13	7	6	13	9)	Airport
1977	11	10	10	15	11)	
1978	11	7	10	15	10)	

Source: Section A, each year divided by 1970-71 average.

- Detail by Mileage Bands

C. 0-299 Miles

Year	U.S. Total	Kansas City	Kansas City % of U.S.	
1970	52,258,380	465,090	.89%	Old
1971	48,783,760	436,400	.89	Airport
1972	52,547,420	453,360	.86	Transition
1973	57,161,900	397,730	.70	
1974	59,375,600	444,020	.75	New
1975	54,496,220	426,040	.78	
1976	56,230,400	433,180	.77	Airport
1977	60,200,200	473,760	.79	
1978	66,713,140	525,790	.79	

D. 300-599 Miles

1970	54,103,460	901,980	1.67%	Old
1971	54,901,060	917,570	1.67	Airport
1972	59,981,060	977,780	1.63	Transition
1973	63,771,040	974,650	1.53	
1974	65,969,360	995,930	1.51	New
1975	62,711,740	985,370	1.57	
1976	66,971,640	1,040,600	1.55	Airport
1977	74,076,840	1,119,100	1.51	
1978	82,021,460	1,277,380	1.56	

Source: See page 5 of this exhibit.

- Detail by Mileage Bands

E. 600-999 Miles

Year	U.S. Total	Kansas City	Kansas City % of U.S.	
1970	43,806,540	509,260	1.16%	) Old
1971	45,791,260	522,050	1.14	) Airport
1972	51,572,700	563,330	1.09	) Transition
1973	55,339,340	573,320	1.04	)
1974	57,182,320	584,780	1.02	) New
1975	56,419,880	601,780	1.07	)
1976	60,822,580	658,500	1.08	) Airport
1977	66,385,280	690,220	1.04	)
1978	77,398,680	808,260	1.04	)

F. 1000 Miles & Up

1970	65,734,980	806,910	1.23%	) Old
1971	67,057,100	797,010	1.19	) Airport
1972	74,432,360	838,060	1.13	) Transition
1973	78,676,100	839,830	1.07	)
1974	81,095,980	833,310	1.03	) New
1975	83,951,220	897,370	1.07	)
1976	90,469,700	953,180	1.05	) Airport
1977	98,265,860	1,015,290	1.03	)
1978	117,755,300	1,212,760	1.03	)

Source: C.A.B. Airline Traffic Survey, Tables 5 and 8.

SERVICE STIMULATION IN INTERRELATED MARKETS

The smaller market of an interrelated pair will have a greater traffic response to service change than an independent market, because the recapture of traffic from (or diversion to) the other market in the pair must be added to the normal stimulation (or destimulation). The normal stimulation is around 15% per service step on the MacNeal Air Service Scale (see Appendix J); it jumps to almost twice that for the smaller market of an interrelated pair. Several analyses illustrating these higher stimulation rates follow:

1. Page 2 - Toledo-Detroit relationship based on data for fiscal 1973. Note the uncanny confirmation of the 1969 line in spite of the fact that every point from which it was derived had changed.

2. Page 3 - Same as item 1, but based on data for 1969.

3. Pages 4&5 - Same as item 1 but showing percent of Toledo's traffic using Toledo.

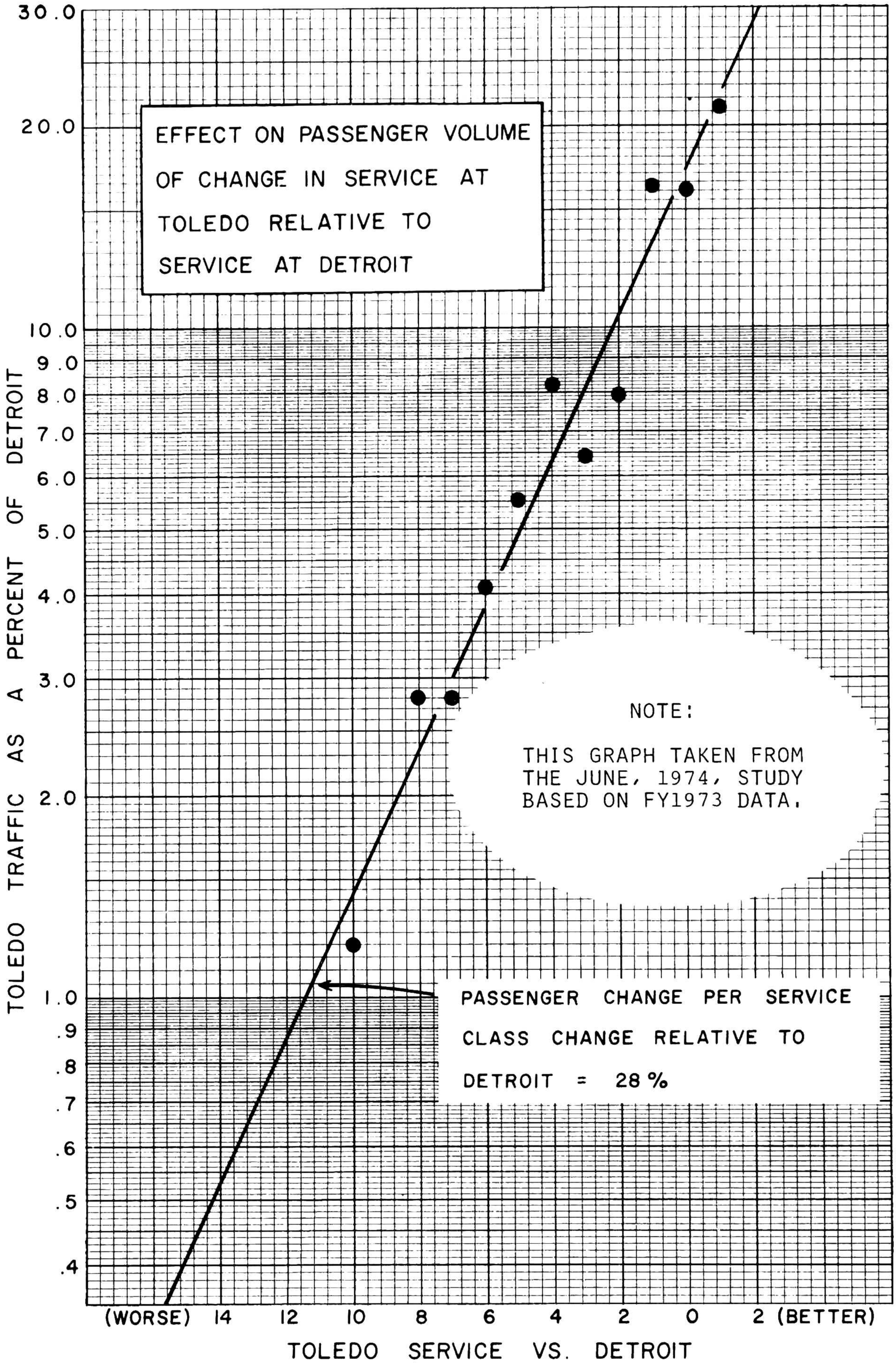
4. Page 6 - Youngstown-Cleveland/Pittsburgh relationship.

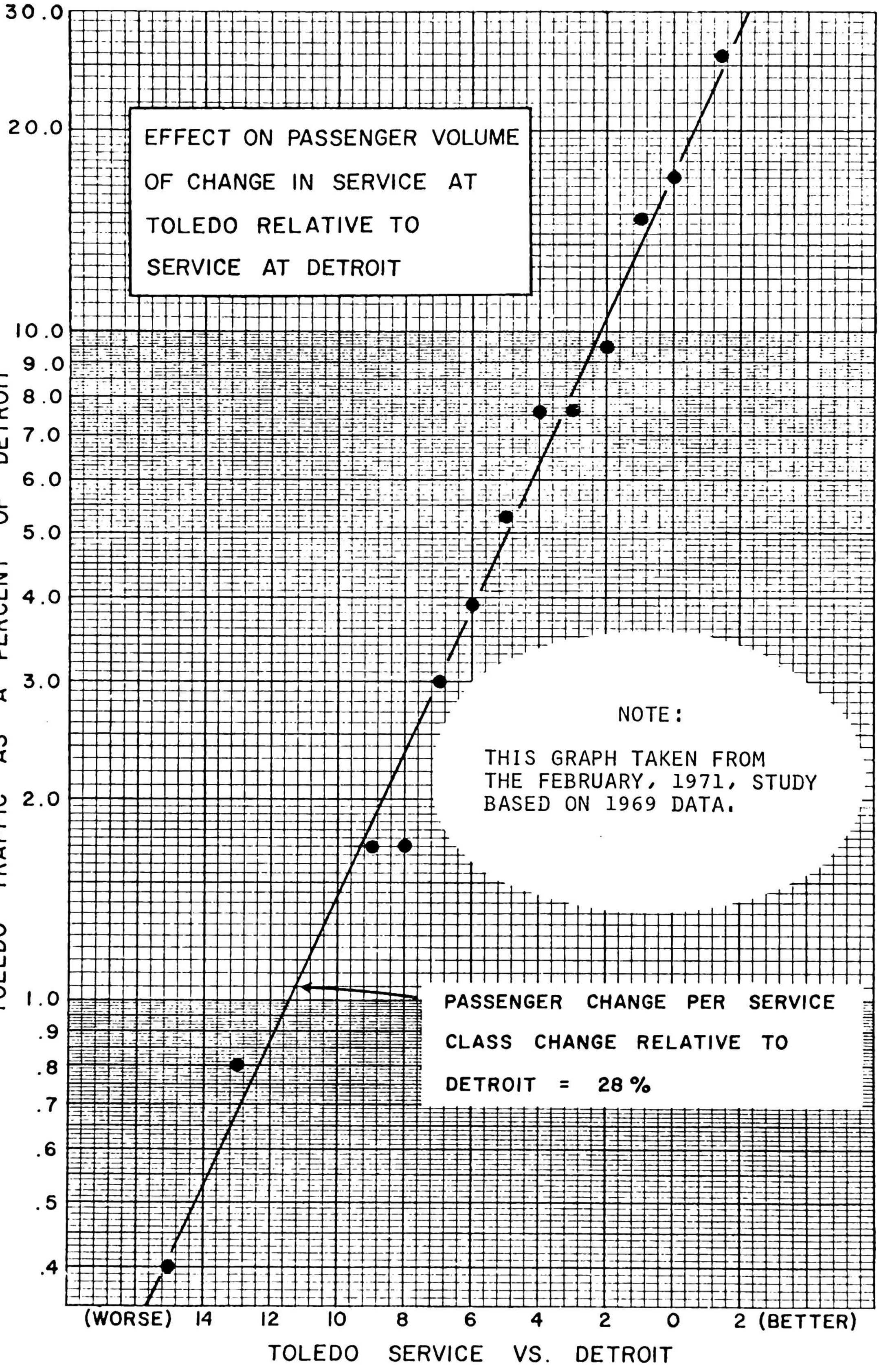
5. Page 7 - Same as item 4, but showing percent of Youngstown's traffic using Youngstown.

6. Pages 8&9 - Detailed analysis of Youngstown trips by airport by time of day and service with Chicago and New York.

Other studies produce similar results. A study on the Newport News-Norfolk relationship, where there is an intermediate unpopulated area (Chesapeake Bay), showed the markets to behave independently until Newport News service is more than three steps worse than Norfolk, at which point Newport News behaves as if it were a satellite of Norfolk (not shown).

Source: Balance of this appendix, studies cited, and Appendix J.


EFFECT ON PASSENGER VOLUME OF CHANGE IN SERVICE AT TOLEDO RELATIVE TO SERVICE AT DETROIT
NOTE:
THIS GRAPH TAKEN FROM THE JUNE, 1974, STUDY BASED ON FY1973 DATA.
PASSENGER CHANGE PER SERVICE CLASS CHANGE RELATIVE TO DETROIT = 28 %
TOLEDO TRAFFIC AS A PERCENT OF DETROIT
30.0
20.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
.9
.8
.7
.6
.5
.4
(WORSE) 14 12 10 8 6 4 2 0 2 (BETTER)
TOLEDO SERVICE VS. DETROIT


EFFECT ON PASSENGER VOLUME
OF CHANGE IN SERVICE AT
TOLEDO RELATIVE TO
SERVICE AT DETROIT
TOLEDO TRAFFIC AS A PERCENT OF DETROIT
30.0
20.0
10.0
9.0
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4.0
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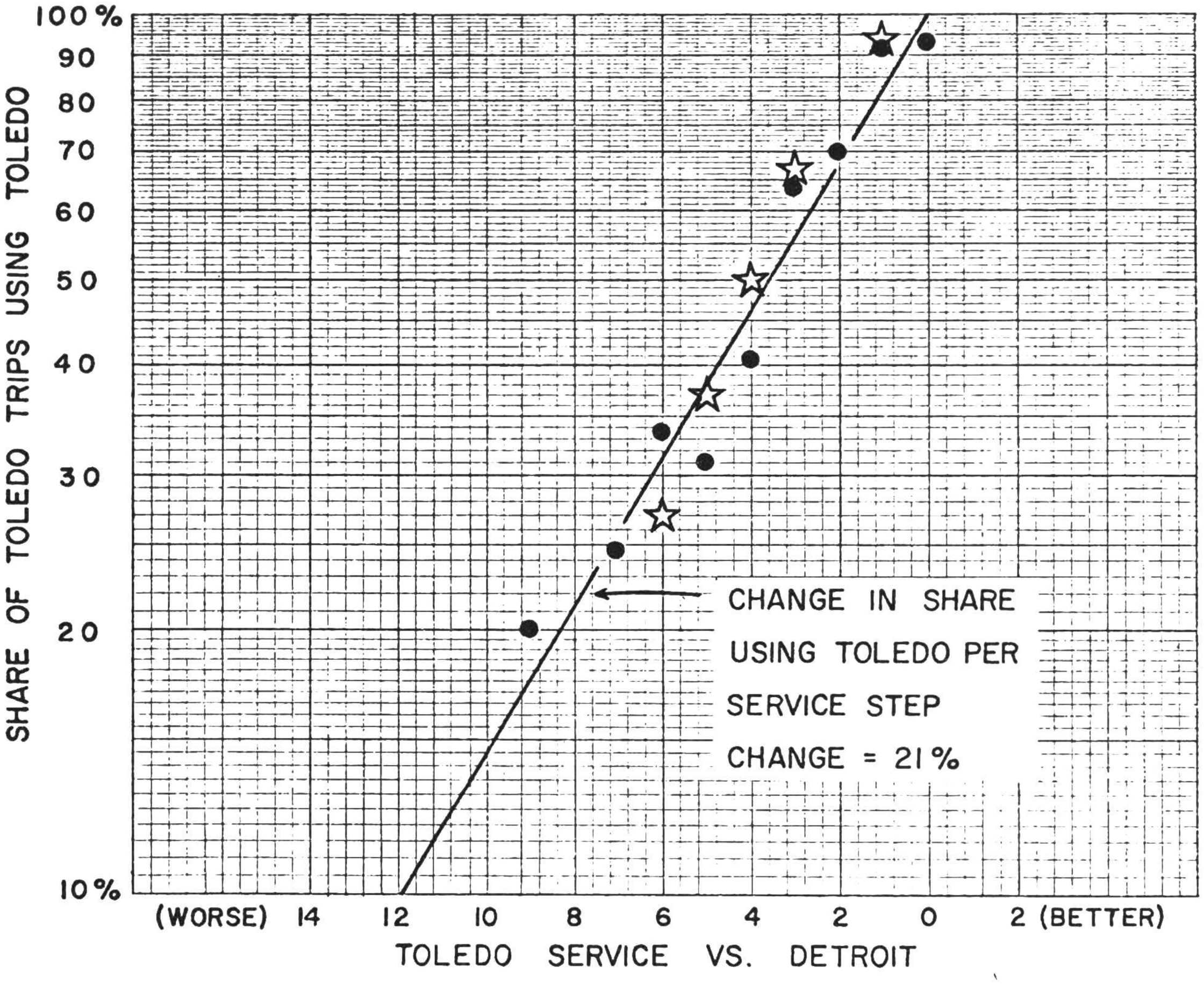
NOTE:
THIS GRAPH TAKEN FROM
THE FEBRUARY, 1971, STUDY
BASED ON 1969 DATA.
PASSENGER CHANGE PER SERVICE
CLASS CHANGE RELATIVE TO
DETROIT = 28 %
(WORSE) 14 12 10 8 6 4 2 0 2 (BETTER)
TOLEDO SERVICE VS. DETROIT

EFFECT ON SHARE OF TOLEDO TRIPS
USING TOLEDO OF CHANGE IN SERVICE
RELATIVE TO DETROIT SERVICE

(Graph from February, 1971, Air Service Requirements study, plus new data (☆) from page 1* of this Appendix)

[* page 5 herein]



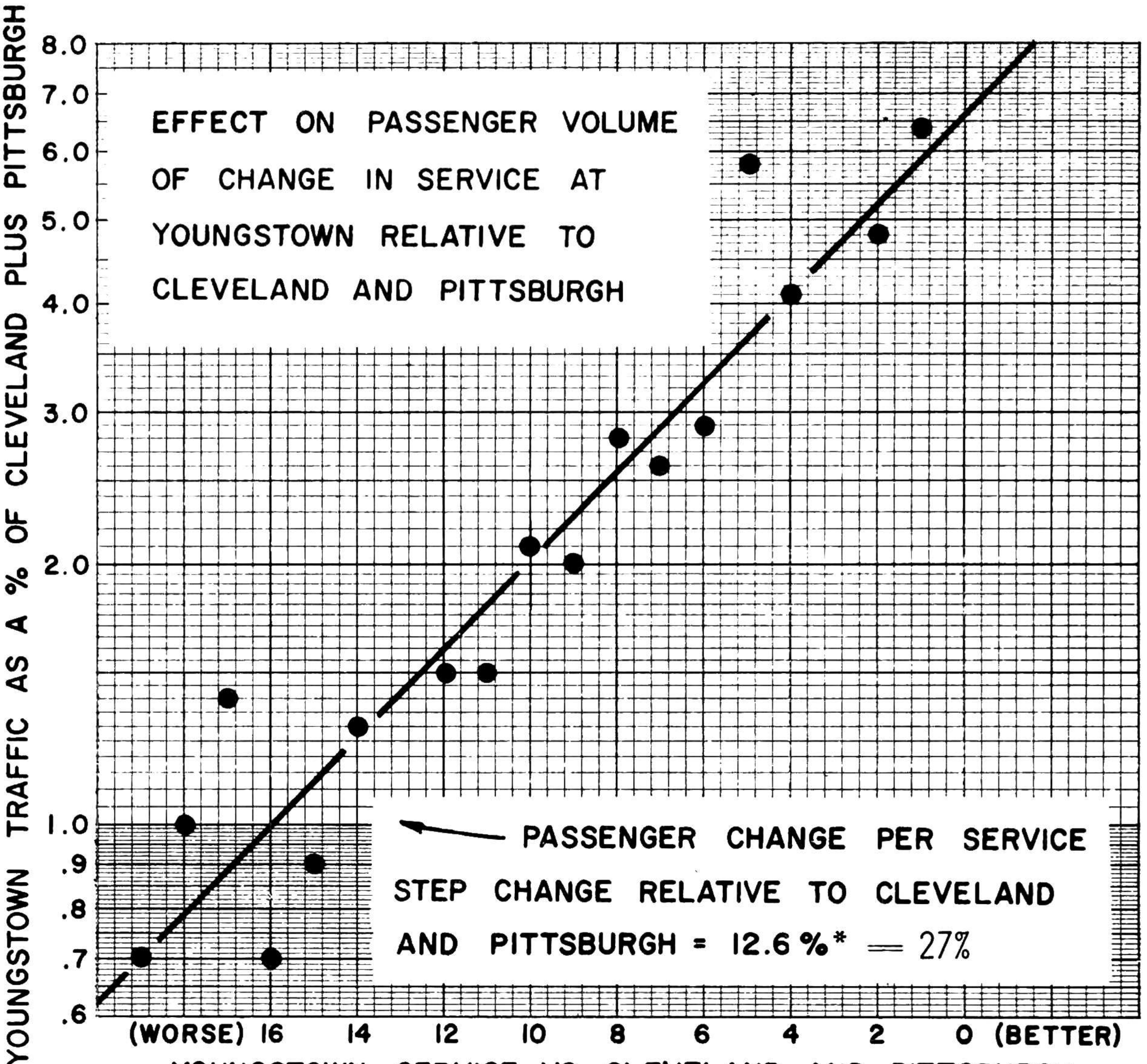
For example:
Toledo share at 3 service steps worse = 55.4%
Toledo share at 2 service steps worse = 67.0%
Thus, 67.0 ÷ 55.4 = 1.21, or 21% higher share.

Source: Toledo Area Air Travel Survey, 1975.

CHOICE OF AIRPORT IS RELATED TO
RELATIVE QUALITY OF SERVICE

Service Quality Steps By Which 1974 Toledo Service Was Worse Than Detroit Service	First Destination	Trips Departing From Toledo, Detroit, Or Other Known Airport		
		Total	Toledo	
			Number	Percent
(1)	(2)	(3)	(4)	(5)
-9	Milwaukee	10	0	0%
-6	Philadelphia	15	4	27%
-5	Boston	11	1	9
	Dallas	9	3	33
	San Francisco	15	4	27
	Washington	25	14	56
	Subtotal	60	22	37%
-4	Denver	14	7	50%
-3	Atlanta	10	8	80
	Miami	18	13	72
	New York	60	37	62
	Pittsburgh	12	10	83
	Tampa	10	6	60
	Subtotal	110	74	67%
-1	Chicago	69	65	94
	Columbus, O.	13	12	92
	Subtotal	82	77	94%
Total Listed		291	184	63%
All Other		177	86	49
Grand Total		468	270	58%

Source: Col. (1) - Comparison of Toledo and Detroit service using MacNeal Air Service Scale. See "Scheduled Air Service Requirements at Toledo," June, 1974.
(2)-(4) - Toledo Air Travel Survey. Includes all markets with nine or more trips reported in detail.
(5) - Col. (4) divided by Col. (3).



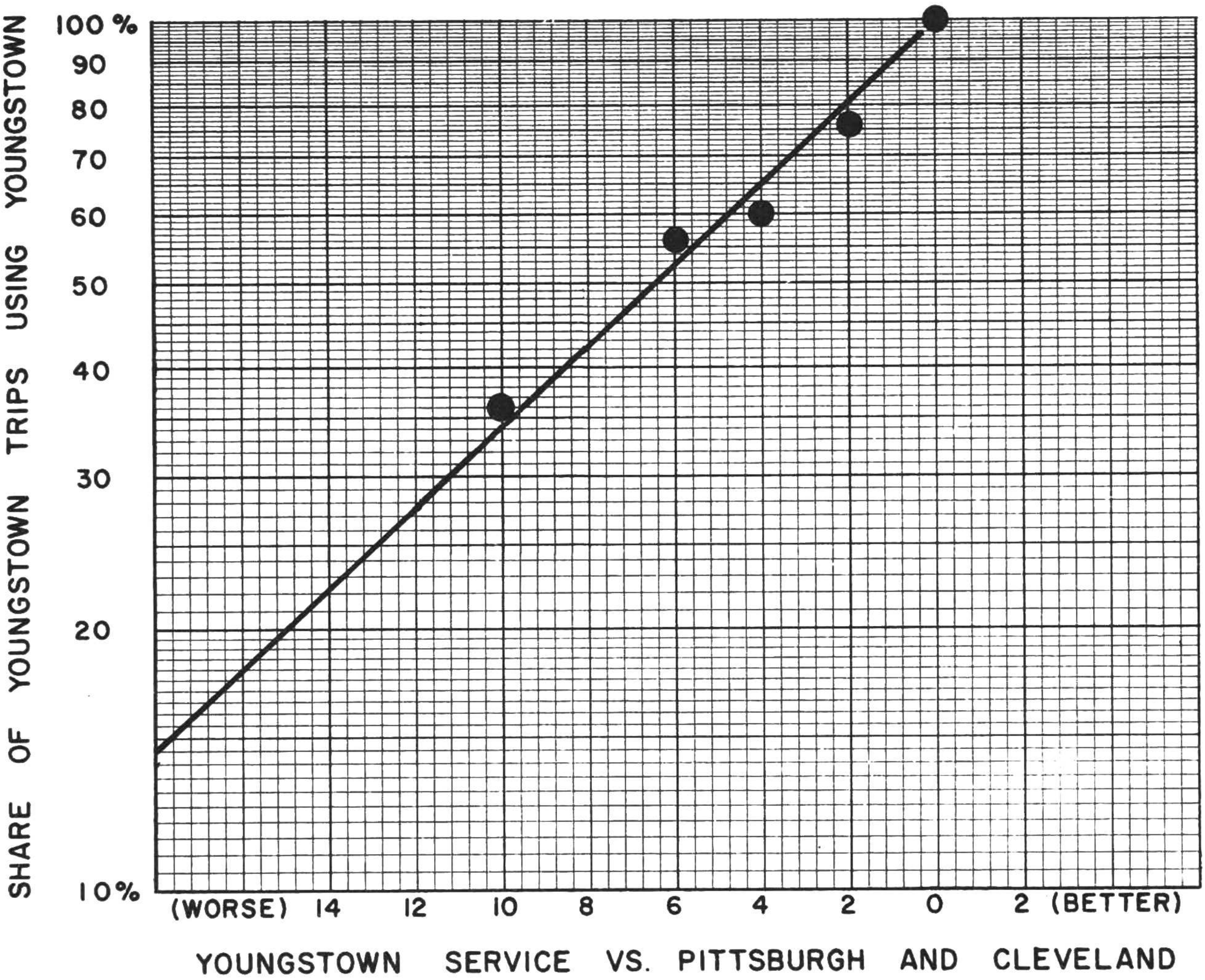
*12.6% per step relative to either station
=27% per step relative to both stations together.

Youngstown Service Steps Worse	Youngstown 1972 Passengers as a % of Cleveland+Pittsburgh	Youngstown Service Steps Worse	Youngstown 1972 Passengers as a % of Cleveland+Pittsburgh
1	6.4%	10	2.1%
2	4.8	11	1.5
4	4.1	12	1.5
5	5.8	14	1.3
6	2.9	15	0.9
7	2.6	16	0.7
8	2.8	17	1.4
9	2.0	18	1.0
		19	0.7

Source: Scheduled Air Service Requirements at Youngstown, Ohio, 1974.

EFFECT ON SHARE OF YOUNGSTOWN TRIPS USING YOUNGSTOWN OF CHANGE IN SERVICE RELATIVE TO PITTSBURGH AND CLEVELAND SERVICE

(Graph of data from page 1 of this Appendix)



Source: Youngstown Area Air Travel Survey, 1975.

USE OF YOUNGSTOWN VS. PITTSBURGH OR CLEVELAND AIRPORTS
BY YOUNGSTOWN RESIDENTS ON CHICAGO AND NEW YORK TRIPS

- Chicago Trips

Time Of Local Departure (1)	Percent Of Youngstown Residents Leaving For Chicago: Via Youngstown (2)	Via Pittsburgh (3)	Via Cleveland (4)	Total (5)	Percent Youngstown Of Total (6)	Service From Youngstown (7)
600a - 759a	45.2%	-	-	45.2%	100%	Nonstop
800a - 1159a	6.9	5.5%	12.3%	24.7	28	Connecting
1200n - 159p	11.0	-	-	11.0	100	Nonstop
200p - 659p	2.7	4.1	5.5	12.3	22	Connecting
700p - 759p	6.8	-	-	6.8	100	One-stop
Total	72.6%	9.6%	17.8%	100.0%	73%	

Time Of Chicago Departure (1)	Percent Of Youngstown Residents Returning From Chicago: Via Youngstown (2)	Via Pittsburgh (3)	Via Cleveland (4)	Total (5)	Percent Youngstown Of Total (6)	Service To Youngstown (7)
Up to 1030a	4.1%	-	1.4%	5.5%	75%	Nonstop
100p - 159p	-	-	1.4	1.4	0	(No listed (service
200p - 429p	4.1	-	-	4.1	100	Nonstop
430p - 729p	20.5	6.9%	9.6	37.0	56	Connecting
730p - 1159p	43.8	2.7	5.5	52.0	84	Nonstop
Total	72.5%	9.6%	17.9%	100.0%	73%	

Source: See page 9 facing.

- New York Trips

Time Of Local Departure (1)	Percent Of Youngstown Residents Leaving For New York: Via Youngstown (2)	Via Pittsburgh (3)	Via Cleveland (4)	Total (5)	Percent Youngstown Of Total (6)	Service From Youngstown (7)
Up to 859a	12.7%	16.4%	-	29.1%	44%	Connecting
1000a - 1229p	5.4	10.9	-	16.3	33	Connecting
130p - 359p	-	9.1	1.8%	10.9	0	(No listed (service
400p - 729p	38.2	5.5	-	43.7	88	Nonstop (EWR)
Total	56.3%	41.9%	1.8%	100.0%	56%	

Time Of New York Departure (1)	Percent Of Youngstown Residents Returning From New York: Via Youngstown (2)	Via Pittsburgh (3)	Via Cleveland (4)	Total (5)	Percent Youngstown Of Total (6)	Service To Youngstown (7)
1000a - 1229p	3.6%	3.6%	-	7.2%	50%	Connecting
400p - 729p	36.4	16.4	1.8%	54.6	67	Nonstop (EWR)
730p & After	16.4	21.8	-	38.2	43	Connecting
Total	56.4%	41.8%	1.8%	100.0%	56%	

Source: Cols. (1)-(6) - Youngstown Area Air Travel Survey, 1975. Preliminary tabs based on all Chicago and New York trips, including those where these cities were not necessarily the first destination or the last origin.

Col. (7) - Official Airline Guide, December, 1974, and January, 1975. The schedules shown are those in effect during the two months prior to conduct of the Youngstown Area Air Travel Survey.

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Index

Aircraft, size of, 16, 48
Airline
  company statistics, 35
  cost versus passenger time, 21
  deregulation, 4, 21, 35
  load factors, 4
  schedules, 5, 19, 31, 32, 45-50, 95
Air passenger transportation
  convenience of, 3, 5, 19, 21, 28-34, 36, 37, 41-43, 45-50, 73
  cost of, 3, 20-22, 33
  current status of, 23
  difficulty in discussing, 3-5, 9, 10, 34
  fundamental aspects of, 3, 5
  round trip decisions, 5, 12, 18, 30, 31
  substitutes for, 4, 19, 28, 29, 44, 45, 65
Airport
  accessibility of, 5, 28, 41, 43-50, 97-106
  alternate airports, 96
  location affects number of trips. *See* Passengers, number of
  "moving" an, 41-42
Airport Operators Council International, 3, 55
Air service, 4, 19, 21, 29-33, 35-38, 48-49. *See also* Airline, schedules; Air passenger transportation; MacNeal Air Service Scale
Air travel. *See* Travel
Air trips. *See* Trips
Air Wisconsin, 42, 95
Akron, 36, 37, 42, 96
Allegheny Airlines, 57, 62
Aviation Daily, 3

Boston, Mass., 33, 93, 96
Bridgman, P. W., 10
Brown, J. F., 88. *See also* Landrum & Brown
Brown County. *See* Green Bay
Buffalo, N.Y., 57, 68, 85, 93, 97. *See also* Niagara Frontier Transportation Authority
Butte, Mont., 44, 68, 93, 94, 97

Carcopino, J., 16
Cedar Rapids, Ia., 73-77, 85, 86, 93, 94
Chicago, Ill., 31, 32, 41, 42
Cincinnati, O., 93
Civil Aeronautics Board (C.A.B.), 9, 11, 16, 22, 35, 37, 55
  Airline Traffic Survey, 11, 54, 62, 63, 96, 103, 106
  cases, 22, 37, 44, 56-59, 68, 69, 85-87, 93, 94, 97-102
  /F.A.A. Airport Activity Statistics, 73
Columbia, S.C., 91-95
Convenience of round trip. *See* Air passenger transportation, convenience of

INDEX

Dallas, Tex., 31, 41, 45, 97-99, 101
Dayton, O., 68, 93, 94
Decision making, 3, 10, 20, 22, 30, 33, 50. *See also* Passengers, as decision makers
Decision-making patterns, 5, 21
  absolute, 21
  goal-directed, 18, 21
  responsive, 21
Dees, T., 38
De Havilland, 95
Delta Air Lines, 3, 58
Demand, 18, 19, 27, 28, 31, 33, 34, 36, 37
  relative to cost, 27, 28, 34, 44
Denver, Colo., 32, 38, 93, 94, 96
  passengers versus population, 9, 10
  types of passengers, 54
Denver-Atlanta, 37, 38
Detroit, 41, 96, 99, 100
Diesing, P., 21
Distance
  air, 27, 28, 31, 32, 45
  ground, 42-50
Diurnal
  definition of, 16
  nodes, 16, 22
Dulles airport, 102
Duration of trip, 24, 25, 27-29. *See also* Nights away

Federal Aviation Administration, 9, 16, 58, 68, 102
Fort Dodge, Ia., 42, 93, 96
Fort Wayne, Ind., 93, 95
Fort Worth, Tex., 101
Frank, P., 10

Glossary of Air Transportation Terms, 55
Grand Rapids, Mich., 42, 68, 93, 96
Green Bay, Wis., 44, 85, 93, 94, 96, 98

Handbook of Everyday Law, 55
Hayakawa, S. I., 10
Henson Aviation, 95
Hopi language, 13-15

Jacksonville, Fla., 93, 96
Johnson, W., 10

Kallio, H. A., 33
Kansas City, Mo., 41, 46, 58, 68, 85, 86, 93-96, 99, 102-106
Korzybski, A., 10

Landrum & Brown, 16, 98
Linguistic habits, 14
Load factors. *See* Airline, load factors
Los Angeles, Calif., 55, 88, 98
Louisville, Ky., 32, 36, 37, 68, 93

MacNeal, E.
  air travel of, 9, 33, 52, 53
  cited, 36
MacNeal Air Service Scale
  development of, 30-33
  range, 33
  scoring rules, 89-92
  in use, 35-36, 73-87, 93-95, 107-113
Edward MacNeal Associates, 92
Magical Instantaneous Transporter (MIT), 24, 25
Mannheim, K., 18
Marshalltown, Ia., 68, 93
McGuire, D. F., 55
Metropolitan Washington Airports Policy, 16, 58, 68, 102
MIT. *See* Magical Instantaneous Transporter
Moore, C. A., 55

National Airlines, 55
New Jersey-New York Metropolitan Area, 98
Niagara Falls, N.Y., 97, 99
Niagara Frontier Transportation Authority, 57, 58. *See also* Buffalo
Nights away, 16, 22, 25, 27, 28, 46, 69-72, 85-88
Norfolk, 55, 68, 69, 93, 94

Norfolk-Baltimore
passenger survey, 64-67
testimony of travelers, 59-61, 69-72
traffic and service, 19, 38, 62
Norfolk-Newport News, 95, 96, 107
Norfolk-Pittsburgh, 95
Norfolk-Washington, 63, 102
North Central Airlines (Republic), 42

Official Airline Guide, 24, 62, 115

Pan American World Airways, 55
Passengers
coupon, 11, 37, 38, 54
as decision makers, 18-19, 30-33, 44, 47-49
enplaned, 9, 11, 12, 52, 53
extensional definition of, 10, 11
in general, 3-5, 9-11, 19, 34, 35
intensional definition of, 10
number of, affected by
airport location, 5, 41-50, 88, 95, 97-106
schedules, 5, 19, 28, 29, 31, 33, 35-38, 47-49, 58, 62, 64, 73-84, 89, 91
schedules and location, 5, 24-25, 29, 42, 45-50, 73-84, 95, 107-115
type of, 9-13, 34, 35, 38, 52-54
on board, 11, 12, 35, 37, 38, 52, 53
on-line, 9, 11, 37, 38, 52-54
as persons, 4, 9, 11-14, 19, 29, 55
round trip, 12, 19, 24, 28-31, 52, 53
term falls into disuse, 25
terminals entered, 9, 53
true origin-destination, 9, 11, 19, 34-38, 52-54, 89
Philadelphia, Pa., 22, 33, 42, 57, 68, 85, 87, 93, 94, 96
Plurals, imaginary, 5, 12, 13
Portland, Ore., 33, 93, 96

Quality of Service Index, 16, 56-58

Rationality
functional, 5, 18, 19, 44
substantive, 5, 18, 19, 44
Reasons
for passenger traffic fluctuation, 18, 19, 33. *See also* Passengers, number of
for travel, 17, 18, 59-61
Relative movement, 4
Republic Airlines. *See* North Central Airlines
Richmond, Dr. S. B., 32
Rockford, Ill., 42
Roget's International Thesaurus, 3d ed., 15
Rome, ancient, 16
Ross, M. J., 55
Round trips
convenience of, 3, 5, 18, 28-37, 41-42, 45, 46, 48-50
decisions on, 5, 12, 30
number of, 9, 11, 12, 34, 35, 41, 45, 52, 53, 65
quality of service for, 31, 33, 36, 76, 77, 89-92
as units of choice, 5, 29

Saginaw, Mich., 93, 100
Sales Management Survey of Buying Power, 10
Savannah, Ga., 93, 94
Seats
available, 4, 16, 31
occupied, 4, 11
Seawell, W., 55
Semantics, 4, 5, 9-16, 18, 29, 34, 35, 37, 41, 44, 50, 55, 88
Shreveport, La., 93
South Bend, Ind., 68, 85, 93, 95, 96
Spatial metaphors, 4, 5, 13, 15, 16, 41
Stodola, E. T., 44

Time
cycles, 5, 12, 13, 15, 16
dimensions of travel, 5, 16, 22-31, 44, 45, 69-72, 85-88, 98
in English and Hopi, 4, 5, 12-15
ground, 41-44, 95, 97
not in QSI, 16, 57, 58

Time (*continued*)
of schedules, 19, 23, 24, 30-33, 45, 47-49, 57, 58, 89-92, 95, 114, 115
spatial metaphors for, 4, 5, 13, 15 16, 34
types of, 20, 21
value of, 20-22, 44, 68, 69, 72, 85
Toledo, O., 68, 93, 96
Toledo-Detroit, 107-111
Trans World Airlines, 58
Travel
air service versus trip duration, 85-88
frequency versus duration, 24, 25, 27-30, 44
history of, 23, 24
policies, 30
Trenton, N.J., 42, 68, 93, 96
Trips
necessity of, 17-19, 43, 44
purpose of, 17, 59-61
reasons for cancellation of, 19, 45, 46, 64
repetitive nature of, 12, 44
versus passengers, 11, 19, 25, 28, 29, 35
See also Passengers; Round trips
Tulsa, Okla., 93

USAir. *See* Allegheny Airlines

Washington National Airport, 102
Western Airlines, 57, 58
Whorf, B. L., 12, 13, 15

Youngstown, O., 68, 85, 93, 96
Youngstown-Cleveland/Pittsburgh, 42, 107, 112-115

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